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# This Week in The IRON AGE

Vol. 154, No. 1

July 6, 1944

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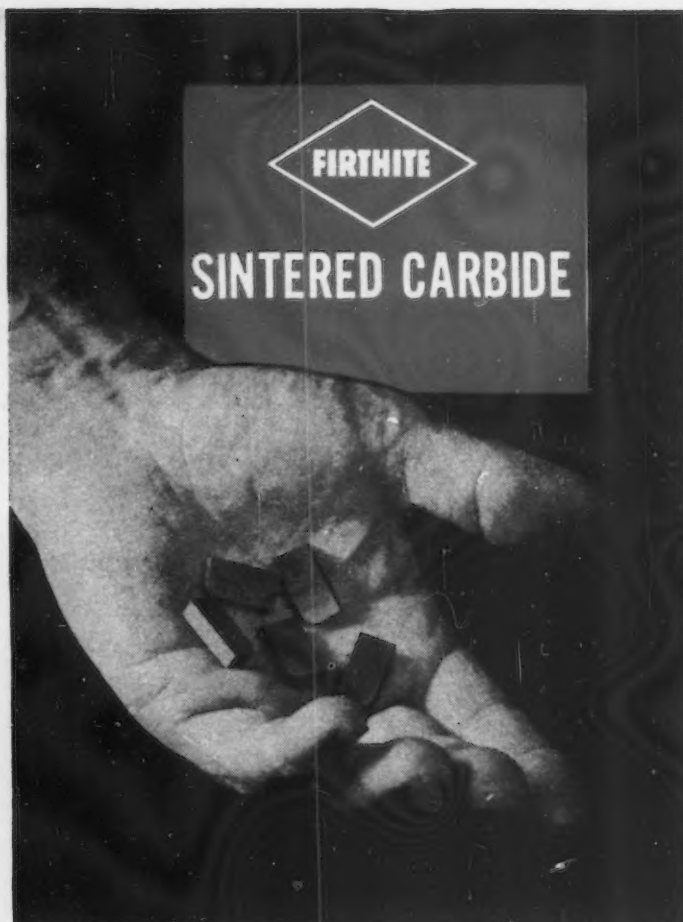
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## THERE ARE PLACES FOR BOTH . . .

Firth-Sterling, long specialists in making steels for shop tooling, early recognized the possibilities of carbides as a means of extending the improvement in shop practice brought about by the super high-speed steel—CIRCLE C. **But, there is a place for both . . .**

Where the highest speeds are obtainable or materials are hardest, FIRTHITE is the "last word" in a cutting material. It is used at speeds up to ten times those possible with high-speed steels. Where speeds above average are permissible or materials are "on the hard side," CIRCLE C will cut *at least 25%* faster than ordinary grades of high-speed steel. Send for descriptive literature on these remarkable materials.

### *For instance:*

**FIRTHITE** removes 730 pounds of gray-iron casting metal per hour instead of 180 pounds;

*drills* a gun barrel in 23 minutes instead of 1 hour;

*enables* milling-cutters to run at 1,000 feet per minute instead of 100 feet with previous materials.

### *For instance:*

**CIRCLE C** machines hard die blocks in 28 hours instead of 42 hours . . . doubling production between grinds—versus regular high-speed steel;

*turns* two to ten times more pieces of heat-treated alloy steel between grinds than other high-speed steels.

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# The IRON AGE

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## Are You a Muscle-bound Manager?

PEOPLE have a way of lumping things together and labeling them with names that are confusing. Take the well-known terms, capital, management and labor. Three pigeonholes, these, into which ostensibly you can neatly separate three functional classes.

This lumping gives one a poor start towards clear thinking. For there is probably more difference and variety in the contents of any one of these pigeonholes as there is between any two of them.

Even as to definitions there seems to be no agreement. One of my friends defines a "capitalist" as a person who lives on the work of others, whereas another friend will define him as a man who makes it possible for others to live by providing the opportunity for them to make a living.

As to labor, there is the same loose conception of terminology. Spell it with a capital "L" and it means the CIO or the AFL. Spell it with a small "l" and it means the unorganized workers and the independent union members. Spell it with a "u" and it means British labor. Spell it without one and you are in Uncle Sam's territory.

So too with management, which is the subject I want to dwell upon today. I do not like the thought of compulsory grade labeling, but it might be well to apply voluntary grade labeling to management. The grades and shades of it are as many as the hues of the rainbow, running all the way from super-super to pooper-doooper.

Good management must always be well rounded. You can't say it is good if it is well developed in one limb and atrophied in another. Good management takes into account quantity, quality, cost, labor relations and where the business is coming from and the money to make it go.

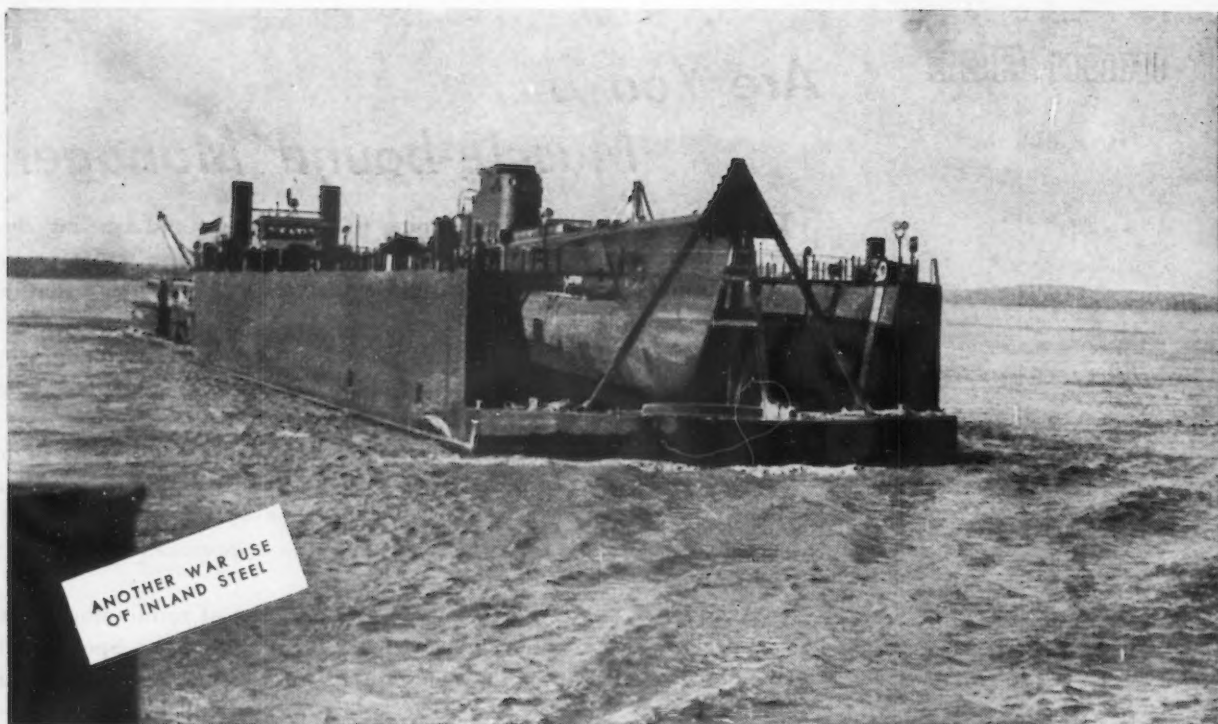
People say, very justly, that management has done a splendid war job. But it has been a one-sided job with tremendous emphasis on quantity. It has been a weight lifting job rather than a juggling feat and weight lifting is apt to make one muscle-bound.

I have heard a good deal about plant reconversion and what should be done about it but not a word yet about the need of management reconversion which is just as important. You have to reconvert the managers before you can do a successful reconversion job on the plants.

Two years and more of weight lifting with quantity as pretty nearly the one and only objective is o.k. for war but not for a peace economy. War has made us improve production wise but this after all is a one sided improvement. Because we have concentrated so hard on meeting schedules, with cost and other considerations distinctly secondary, we have probably lost something that will have to be regained when the emphasis changes from quantity to cost in the postwar world.

Most of you who read this page have managerial functions and it may pay you to think about getting your muscles flexible again after all that heavy lifting.

*J. H. Van Deventer*



ANOTHER WAR USE  
OF INLAND STEEL

Official U. S. Navy photograph.

Ferry float transporting a submarine down  
the Mississippi for delivery at New Orleans.

## FLOATING SUBS TO THE SEA

"Floating Palaces" of Mark Twain's Mississippi River days have given way to watercraft of many kinds. These vessels, built on the Great Lakes, travel down the river to the sea to join the fight against America's enemies. Among these fighting ships are submarines that are transferred down the Illinois-Mississippi Waterway on a ferry float. When a sub has been delivered at New Orleans the ferry is towed upstream to Lake Michigan where it takes on another "fighting" cargo.

Many floating dry docks, as well as the ferry float above, were built by the Chicago Bridge & Iron Co. of plates furnished

by Inland. The dry docks are made in three parts; a large center section and two smaller end sections. When necessary to examine or repair the bottom plates of the dock, the center section can be docked on the two end sections. Likewise, the two end sections can be docked on the center section. When in tow, the end sections are usually docked on the center section.

Before the war, Inland shipped large tonnages of plates to structural shops, tank builders, pipe manufacturers, etc., for peacetime products. When our fighting fleets return to home waters, Inland again will furnish steel for the growing needs of America at peace.



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► Now that the government has permitted automobile companies to do experimental work and to place orders for tools, the prediction is that the immediate postwar car will not be the 1942 model but a really new design.

And: With automotive concerns particularly strong in the stock market rise, Detroit gossips are busily whispering about the possibility of mergers.

► This is the last war that will be fought off the Mesabi iron ore range, according to L. S. Hamaker, of Berger Mfg. Co. (Republic), in a speech last week in New York.

Beneficiation of poorer grades of iron ore is still rather an expensive process, and for many plants it may become cheaper to import ore than to beneficiate low-grade domestic deposits after the war.

► If commercial aviation should increase ten times its pre-war volume it would operate present aircraft producing capacity at about a 4 per cent rate.

► The Germans now claim that reaction-propelled (jet) fighter airplane is being tested in service under operational conditions. It is named the Messerschmitt Schwalbe.

The Allies now have enough jet fighters that they also could soon throw them into combat. With reports of new German jet (robot) bombs operating at speeds in excess of 400 m.p.h., perhaps the Allies will soon use their jet fighters to run them down. Nothing like setting a jet to catch a jet.

The jet fighters furthermore would be operating over home territory, and there would be no danger of one being brought down for enemy examination.

► The German jet bombs have a far more significant implication than is being recognized. This new German weapon, if perfected two years ago, could have won the war for Germany.

But: A technical principle has been proven.

If a one-ton bomb can be sent 100 miles or so with fair accuracy and at speeds over 400 m.p.h., the assumption is sound that future development can send any weight of bomb at far greater distance, at much higher speed and with far more precision.

There is no loss of life on the part of the aggressor. And, the bombs propulsion equipment is simple and inexpensive.

Far greater energy and a great amount of equipment must be used to knock down only a percentage of such bombs.

A small country could secretly build many bombs and blitz many enemy cities within a space of hours. It could make the possibility of sudden wars far more ominous than has the airplane.

► The hundreds of railroad passenger cars that are now on order with carbuilders will not be built for some time. Orders have been placed with builders on an if and when basis, depending upon WPB steel allocations. Greatest hindrance to production is not steel or aluminum but components such as air conditioning units and electrical equipment. Axles and wheels are short. No actual or tentative steel orders for this use are reported yet.

► The armed services including the Navy are planning a "war reserve" of machine tools which will be set up soon. A generous supply of hard to get and special purpose munitions tools will be taken out of production lines as quickly as they fall idle and set up as a pool in temporary storage pending another emergency such as the current shell program. These may be drawn upon from storage during the war but after the war will go in part to completely modernize all arsenals while the remainder will go into permanent storage at the arsenals for future use.

► More than one steel company is mentioned in rumor these days as looking to purchase additional barrel making facilities. One Chicago barrel maker is reported actively soliciting an offer. More barrel shop mergers may be in the wind soon.

► The war has completely changed the character of electroplating, from decorative to protective coatings. However, the total areas now plated are approximately equal to those plated in peacetime.



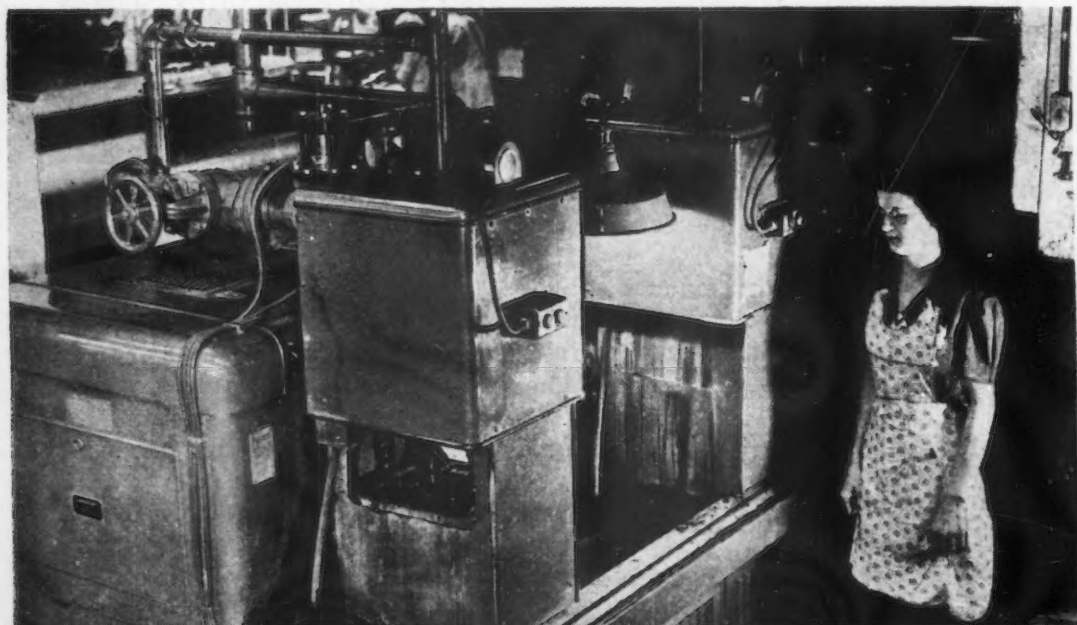
# ... Induction Hardening

**T**HE Eaton Mfg. Co., Cleveland, is widely known as a manufacturer of various types of aircraft parts and subassemblies, inasmuch as most of its 14 plants have been kept busy doing this kind of work since the beginning of the war. However, one of the divisions of the company that in peace time assembled automobile heaters, for the past two

years has been doing an outstanding job in the hardening of armor piercing shot. At the present time, this division is working two shifts a day on the production of 40 mm. armor piercing shot and two types of the 37 mm. armor piercing shot, the monoblock or one-piece shot and the three-piece with the hardened body and cap and windshield. Previously, another

type of 37 mm. armor piercing shot was produced, but this type was discontinued in favor of the more recent design.

The heart of the shot hardening arrangement is the battery of Tocco hardening and drawing units in the plant. For the 40 mm. shot, there are two hardening machines, each of which has two six-shot stations. For



**FIG. 1—**Hardening 37 mm. armor piercing shot on one of the battery of Tocco induction hardening machines at Eaton Mfg. Co., Cleveland. The shot are ready to be removed from the station to the left after heating and quenching, while the closed station indicates shot in the hardening cycle. Shot are raised by a hydraulic lift to the inductors.



**FIG. 2—**In drawing the base of 37 and 40 mm. shot, the induction coils are stationary and the shot are dropped into them. The shot to the left are in the quench stage of the hardening cycle, while those to the right are being heated. Shot is brought to and taken away from the machine on the trough conveyor shown in the foreground.

# g of A. P. Shot

By THOMAS E. LLOYD  
Associate Editor, THE IRON AGE

hardening the 37 mm. shot, two machines are in operation, each likewise having two six-shot stations. For drawing the bases of both the 37 and 40 mm. shot, there are three machines with two stations each, accommodating 12 shots per station. In addition there is a two-station hardener for the penetrating caps for 37 mm. shot.

Shot is shipped in from seven subcontractors with plants in Cleveland and northern Ohio, who rough machine the shot from annealed WD 4150 bar stock or some other Ordnance approved shot steel. As the shot is received, it is inspected and then ground on a Cincinnati centerless grinder to insure concentricity and size. After cleaning in an alkali spray washing machine, the shot is transferred by overhead conveyors to the hardening unit. With each shipment of shot from a new heat of steel, a pilot lot is run through the hardeners to determine the heat treat cycles.

The obvious purpose of heat treating these various types of shot is to develop in them hardness characteristics that will enable them to penetrate the armor of tanks, vessels, and other vehicles of war.

Induction hardening by the Tocco process is used by Eaton Mfg. Co. in heat treating the three types of shot

**. . . At Eaton Mfg. Co.'s heater plant a line for heat treating and finishing 37 and 40 mm. armor piercing shot has been in operation for many months. The Tocco induction heating process—the heart of the operation—provides a fast, easily manipulated and controlled method of heat treating.**

manufactured by this company for several reasons. First, the process is easily controlled once it is set up. A starter button begins the process of heating and quenching on a predetermined cycle, requiring very little in the way of trained or skilled personnel. Being fully automatic, the process eliminates the possibilities of variations in the hardness of the finished shot. Once the cycle is established for a given shipment of rough machined shot, there is little need for maintenance other than spot checking to see that the equipment stays in register.

The installations at Eaton operate on a 440-volt, 3-phase, 60-cycle line. In addition to the water intake and outlet lines, the only connection necessary to the units is the power line. The units have motor generator sets of 80 kw. output capacity for the hardening operations, while the base

draw and cap hardening equipment have 40 kw. capacity motor generators for each unit. All machines are equipped with the automatic controls and preset timers so that once the hardening and drawing cycles are determined, the operator need only load the machine, push the starter button, wait for the cycle to complete itself, and unload the machine.

The operation of induction hardening equipment is based on high frequency current flowing through an inductor thus producing a high frequency, magnetic field within the region of the inductor. When a metal, such as shot, is placed within this field, the dissipation of energy in the steel produces heat, the result of the friction set up within the steel as the molecules attempt to align themselves with the polarity of the rapidly changing magnetic field.

The 37 and 40 mm. types of shot

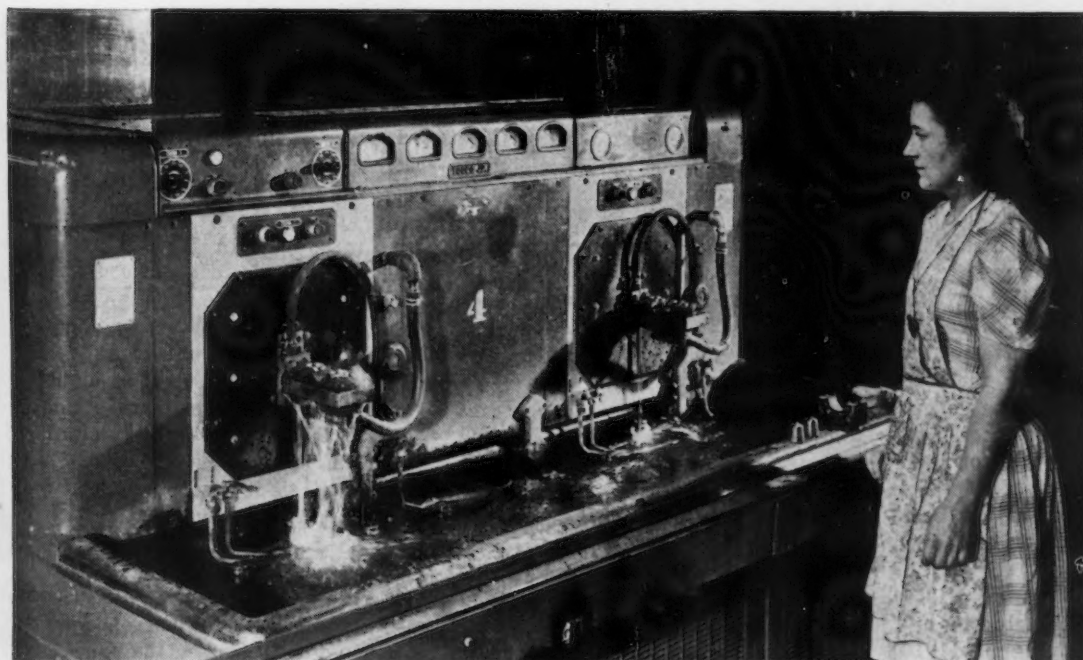


FIG. 3—One type of 37 mm. shot requires a piercing cap. These caps are hardened similarly to the shot on this two-station hardening machine. Samples of the cap can be seen on the tray before the operator.



are placed on hydraulic locator pins that fit into the base of the shot, as shown in Fig. 1. As the cycle is started, the shot rises into the inductor field. After predetermined heating to around 1550 deg. F., the shot is water-quenched for a specified period and is then unloaded. Two stations at each machine permit the operator to unload and load one station while the other is in operation. The fundamental principles of the hardening operation hold good also in the drawing. The equipment used in the drawing operation is similar to that used for hardening except, as shown in Fig. 2, the shot is set down into the induction coils. Likewise, the hardening of the 37 mm. nose caps, shown in Fig. 3, is basically the same as hardening the shot itself.

In hardening the body of the 37 and 40 mm. shot, there is a delay between the end of the heating phase and the quench to permit the heat to soak from the body of the shot toward the nose and also inward toward the center, thus making for a uniformly heated shot.

In hardening, the metal in the shot undergoes a definite change. The structure of the metal originally is pearlitic or of a spheroidized structure. This is changed to a homogeneous austenite on heating, and quenching at the proper rate converts this austenitic phase to the desired martensitic structure. The base draw

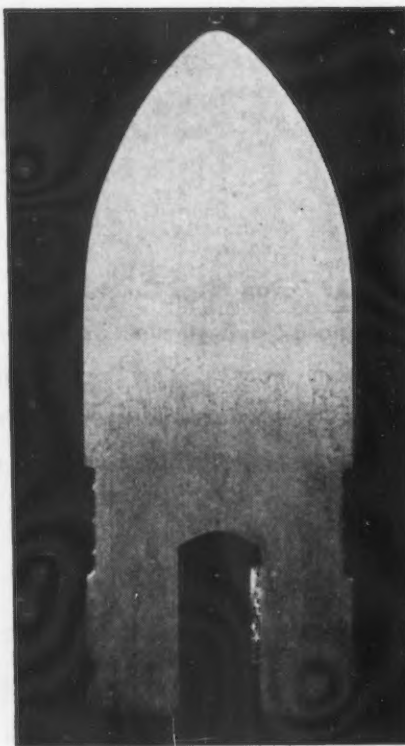


FIG. 4—This photomicrograph illustrates the gradual differentiation in hardness from the nose of the shot to the base, with the hard martensitic structure at the nose and the tempered martensite at the base. This sample was a hardened and base drawn 40 mm. shot, deep etched.

treatment, after hardening, is performed so that the finished product consists of a material with high hardness at the nose or point of impact,

and a gradually decreased hardness as the base is approached. This gives the shot good penetrating as well as destructive power. To further impart ductility to the pieces and to relieve stresses built up in the shot by drastic quenching, the shot is stress relieved.

After stress relieving the shot, which is carried out in a gas fired, air recirculating type unit, the shot are aged for 72 hr. This aging acts somewhat in the manner of a stress relief but on a much reduced scale. While specifications call for this treatment, plant metallurgists question its value. A thermal shock examination follows. This thermal shock is performed by placing the shot in water at 60 deg. F. for 15 min., followed by immediate immersion into boiling water for 15 min., followed again immediately by immersion in water at 60 deg. F. for 15 min. This is supposed to open up any cracks or seams in the shot, but it is quite doubtful that the effect is as desired, because the treatment is believed to be not severe enough.

To show the difference in appearance and the nose to base gradation in hardness of the shot, Fig. 4, a photomicrograph was prepared. This shows a longitudinal section of a hardened and base drawn 40 mm. armor piercing shot. Deep etching brings out the difference from the hard martensitic micro-structure of the nose to the tempered martensite of the base.

## High Frequency Brazing of Mortar Shells

PLAYING a key part in maintaining the production of 4.2 in chemical mortar shells at Lempco Products, Inc., is the use of high frequency electrical induction for brazing the nose adapters and the base plugs to the 14-in sections of seamless tubing that make the shell. Originally, shells were forged and only the nose adapter was brazed to the piece. Switching to tubing (X1335 steel) and perfecting operations for the brazing of the base have proved highly successful. Forging facilities were relieved and much metal saved.

Two Tocco motor generator machines producing 9600 cycles of high frequency current are used. One, a 50 kw. unit, silver solders the base plug to the shells; the other, of 40 kw. output, the nose adapter.

Base plugs turned out of X1335 steel are prepared for brazing by applying the flux and slipping a 3 11/16

in. diameter silver solder ring onto the base before it is assembled by hand into the shell. The solder ring is 3/32 in. diameter wire.

Shells are placed two together in a double water-cooled inductor coil of which there are two on the unit. One station is heating while the other is being unloaded and loaded. The brazing cycle is 56 sec. for two shells while 38 sec. for cooling are provided. Production is at the rate of one shell every 28 sec. Temperature reaches 1400 deg. F.

Rejects are less than ¼ per cent according to Lempco officials. Should pressure tests reveal an irregularity in braze, the shell is returned to the Tocco unit, the base is reheated to melt the solder and the plug removed. After determining the cause of the trouble, the base is reassembled and again brazed.

During the brazing process, shells

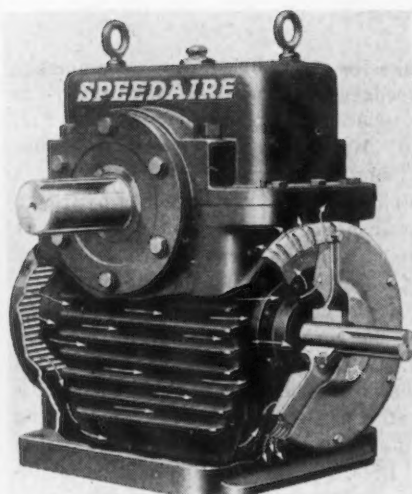
are held in place with 14 lb. of pressure exerted by a 4-way air driven equalizer on the top of each shell. This insures a proper fit of the base plug with the casing as the silver alloy melts.

Next induction operation is that of silver soldering the adapter to the nose in 38 sec.—or 19 sec. per shell. The Tocco unit with two stations, each having a double inductor, handles four shells, two heating while the other two are being unloaded. No air cylinders are needed as the weight of the shell at this stage of production is such as to insure a proper joint between the brazed parts.

In both these operations controls are automatic once the starting button is pushed. Complete uniformity of braze is attested to by the exceedingly low rate of rejections, the greater majority of which result from foreign matter getting between the parts.



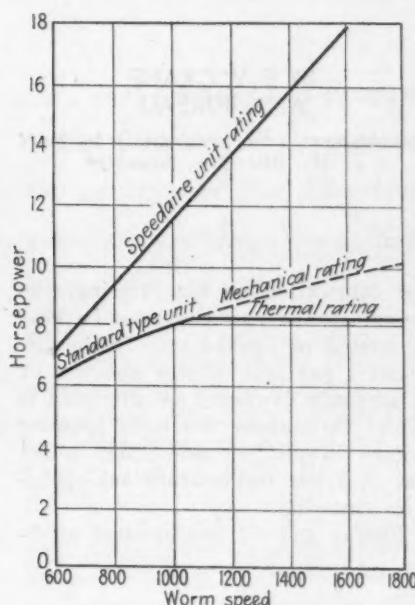
# Worm Gear Ratings Raised By Fan Cooling



**C**UTAWAY view of Cleveland Speedaire worm gear reduction unit. Air under induced draft from a radial fan on the worm shaft enters through the grille at left and is distributed effectively over the warmest surfaces, which are finned.

**N**EWLY announced by the Cleveland Worm and Gear Co., Cleveland, is the Speedaire worm gear reduction unit, incorporating a fan cooling system which permits a pronounced reduction in the size of the unit required for a given horsepower output.

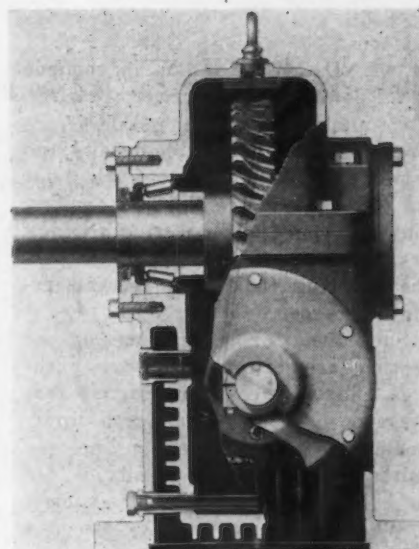
Cleveland's application of fan cooling to the Speedaire unit is based upon a new type of double wall construction which provides an air passage completely enveloping the oil reservoir in which the gearing operates. (See cutaway views.) The inner housing wall, forming the oil reservoir, is deeply finned on the air



**C**OMPARISON of horsepower transmitted with a given speed reduction by a Cleveland Speedaire unit and a standard type unit of the same size.

side, providing a marked increase in heat-dissipating surface. An exhaust fan located on the coupling end of the worm shaft draws air at high velocity through the space between the housing walls from a grille at the opposite end of the unit. This fan is designed to operate with either direction of rotation.

The effect of the double wall construction is to maintain a uniform flow of cooling air against the fins and housing wall over the whole oil reservoir surface. Thus the operating temperature is greatly lowered, giving



**S**ECTIONAL view of Speedaire unit showing size and distribution of the fins, which are cast integrally with the inner wall of the housing.

the Speedaire unit a much greater load-carrying capacity than a standard worm gear unit of equal size, when operated at the usual motor speeds.

In many instances it is possible to obtain an operating capacity with Speedaire units equal to that of standard worm gear units having approximately double the housing dimensions. Under given conditions of installation an advantage may be derived from reduced size or from reduced weight. In either case there is a material reduction in the dollar cost of the Speedaire unit per horsepower of capacity.

## Reduction of Ferromanganese in High Quality Steel Production

**O**NE of the plants located in the Urals has succeeded in saving a considerable amount of ferromanganese in the production of high quality steel in the open hearth furnace, according to N. Doobrov, in the Russian magazine *Stal*, No. 1-2, p. 61. During the period from January to September, 1942, it was possible to reduce the consumption of 75 per cent ferromanganese from 22 lb. to 6 lb. per ton. The raw materials plan called for a consumption of 14 lb. per ton of ferromanganese in the first half of 1942 leaving 10 lb. per ton for the second half of the year. The surprising reduction in the use of ferromanganese was achieved by the following means:

(1) The practice of sweetening the bath with small amounts of ferromanganese was abandoned. But care was taken to keep the manganese content in the steel above 0.30 per cent. Refining is completed when the metal contains 0.25-0.30 per cent Mn. Since the furnace is charged with 35 to 40 per cent pig iron containing from 1.5 to 2 per cent Mn, no special additions of ferromanganese are needed.

(2) If the specifications for the finished steel call for a manganese content between 0.35 to 0.60 per cent, the plant produced a steel containing no more than 0.45 per cent Mn.

(3) The plant substituted the former method of deoxidizing the steel in

the furnace by deoxidizing it in the ladle. Thus a saving of 25 per cent of the ferromanganese was achieved.

(4) In melting the heat the maximum and minimum temperatures in the furnace were closely watched. Also, mild steel was no longer produced since it consumed most of the ferromanganese charged.

Simultaneously with the reduction of the ferromanganese the plant reduced the use of specular iron ore from 48 lb. per ton in January to 18 lb. per ton in September, 1942. The quality of the steel produced during this period improved together with the greater economy in the use of ferromanganese.

# Presses and Processes For

**F**UNDAMENTALLY, in common powder metallurgy practice, suitably prepared powders are pressed in dies to suitable density and intimacy of particle contact. Heat for the interatomic welding or bonding may be applied either during pressing or more commonly after pressing in the sintering (baking or recrystallizing) furnace.

Subsequent sizing or squeezing operations are common for porous bushings, filters, etc. while further hot pressing or cold forging and intermediate annealing operations are required where greater density is desired (see table in preceding article).

Where continuous porosity is needed

BY E. V. CRANE  
A. G. BUREAU

*Development Engineering Department  
E. W. Bliss Co., Brooklyn*

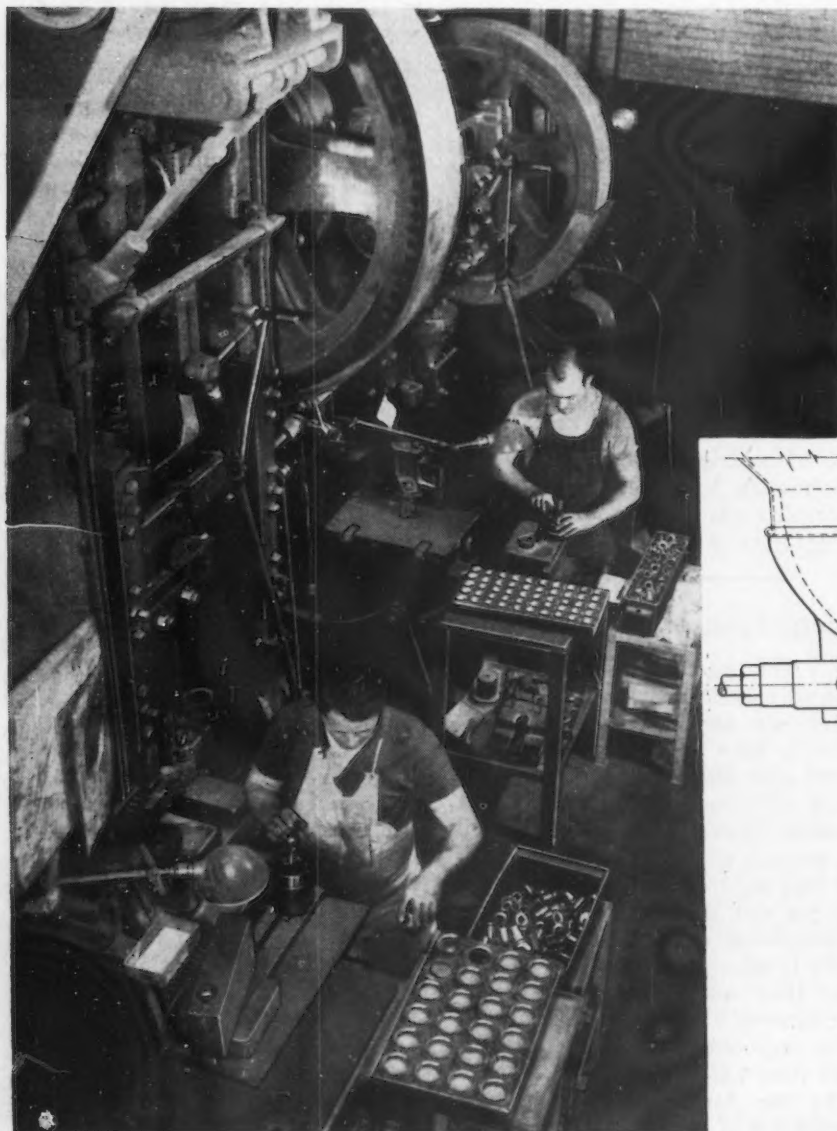
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for lubrication or for filtering, the voids between particles must be kept connected or opened up. To do this about 1 per cent of zinc stearate or other finely powdered metallic soap is mixed throughout the metal powder before briquetting and then boiled out in a low temperature baking before sintering.

Porous and oil impregnated bush-

ings for self-lubrication are commonly produced by powder metallurgy in competition with solid bushings, Fig. 10. Many iron powder bushings use a small percentage of copper as a binder and are sintered in a hydrogen atmosphere (to prevent oxidation) well up in the recrystallization range of copper. At such temperatures, a eutectic copper-iron solution can form at the contact points to join the iron particles, as in copper brazing. In the bronze bearings, the tin is activated to form the copper-tin bonding eutectic among the copper grains.

Dies, Fig. 11, for preliminary molding or briquetting of the powder, may serve also for metering the charge

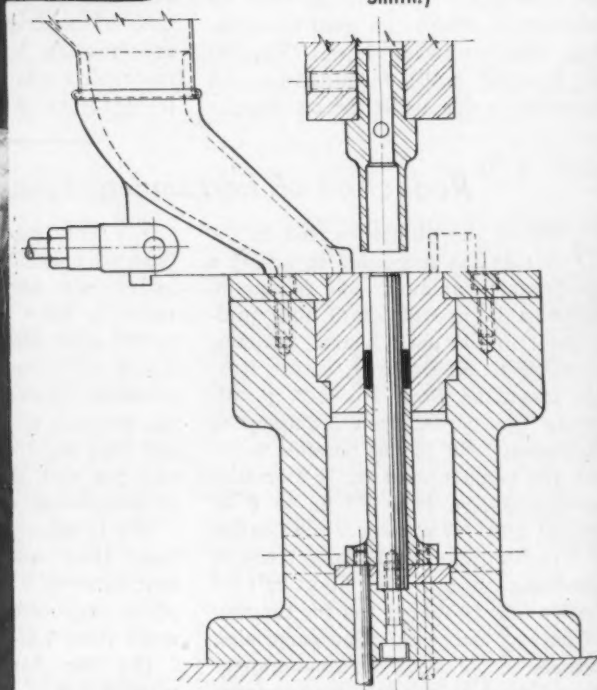


LEFT

**FIG. 10**—For limited lot compacting of flanged bushings at Moraine Products Division of General Motors Corp. weighed charges are transferred from cups to the dies which are pulled out of the single action press. The punch is inserted and the die assembly placed under the ram. Courtesy *The Modern Industrial Press.*

BELOW

**FIG. 11**—Die with highly polished walls for flush fill measuring and briquetting of porous bronze and iron bushings in mechanical pressess fitted with hopper, vibrator and timed knockout. (After Langhammer and Smith.)





# Metal Powder Products . . .

(compression ratio usually approx. 3:1).

In Fig. 12, after ejection of the bushing preform, the knockout below the platen drops back leaving a cavity of proper depth to take the required amount of powder. The operator sweeps it level full and trips the press for the compression stroke. The geared press is run slowly enough to permit entrapped air which has been compressed to escape during the slow period of the stroke. The bushing preform is then ejected and placed in the tray for sintering. The press might be equipped with a hopper for gravity flush filling as indicated at the left in Fig. 11. In the latter case, however, the hand filling permits consistent control together with inspection of work as the parts are removed. Fig. 13 shows one of the double action cam presses also used in briquetting bushing compacts. It shows the cam bottom knockout but not the dial feed, hopper or ejector.

Except where heating is done simultaneously with the pressing operation, the preforms or briquettes are sintered, usually in furnaces con-

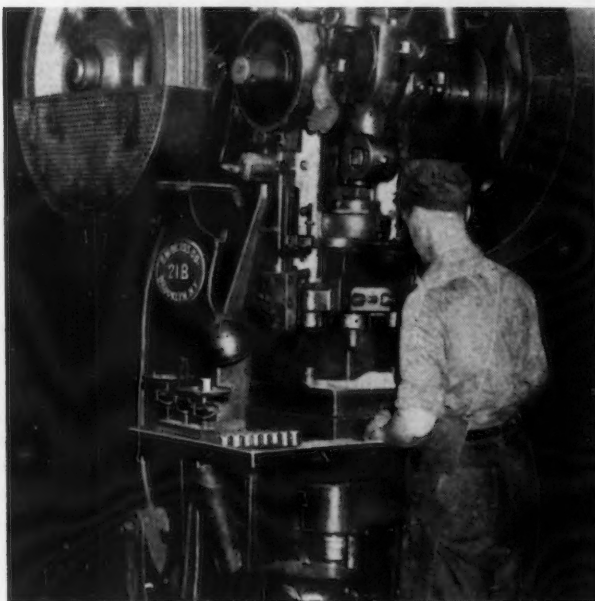
. . . In the second and concluding part of the article, which began in last week's issue, the authors discuss and illustrate the principles for selection of dies, heat treatment and presses that have overcome many of the shortcomings of powder metallurgy techniques.

fining an inert or neutral atmosphere, reducing gas or vacuum. The temperature employed is determined by the metals under treatment and by the characteristics desired in the finished product. In the case of pure metals and in many combinations of metals, no part of the material is melted during the sintering operation. In some cases, however, where a small amount of relatively low melting point metal is used in conjunction with a high melting point metal, the lower melting point metal may be fused. This occurs during the heat treatment of hard carbide compositions.

No fixed rule can be laid down as to the temperature to be employed in the treatment of alloys. Fig. 14 is an electric, double-decked sintering

furnace with hydrogen atmosphere to prevent oxidization. Preforms in trays are pushed through manually and retrieved at opposite end. They move from the charging chamber successively through the heating chamber and the cooling position which is usually water jacketed to bring the temperature down to avoid oxidation before reaching the unloading chamber.

After sintering, the bushings must be sized and burnished accurately in either single or double action presses. In Fig. 15 is shown a die in which a direct connected lift-out is used and the inner mandrel is the moving punch. It is also possible to employ a design in which both inner and outer burnishing surfaces are in the fixed die, and the punch sleeve con-

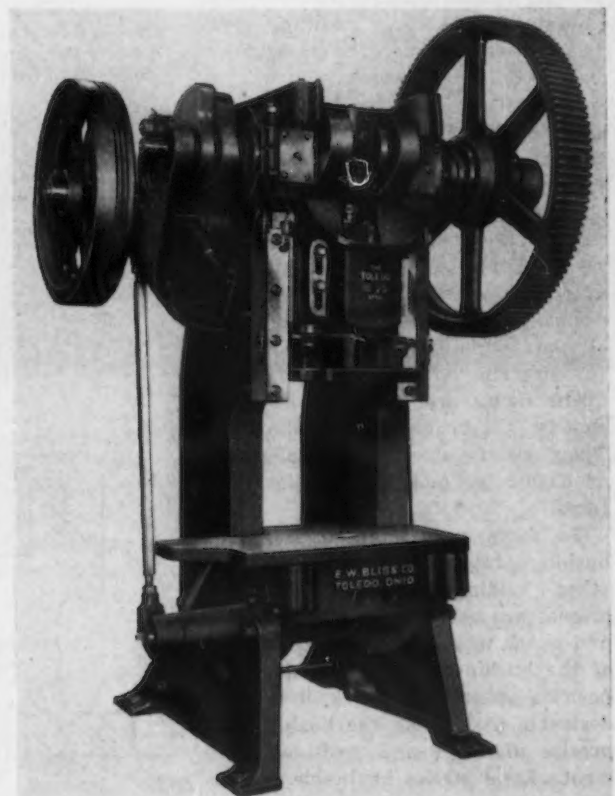


ABOVE

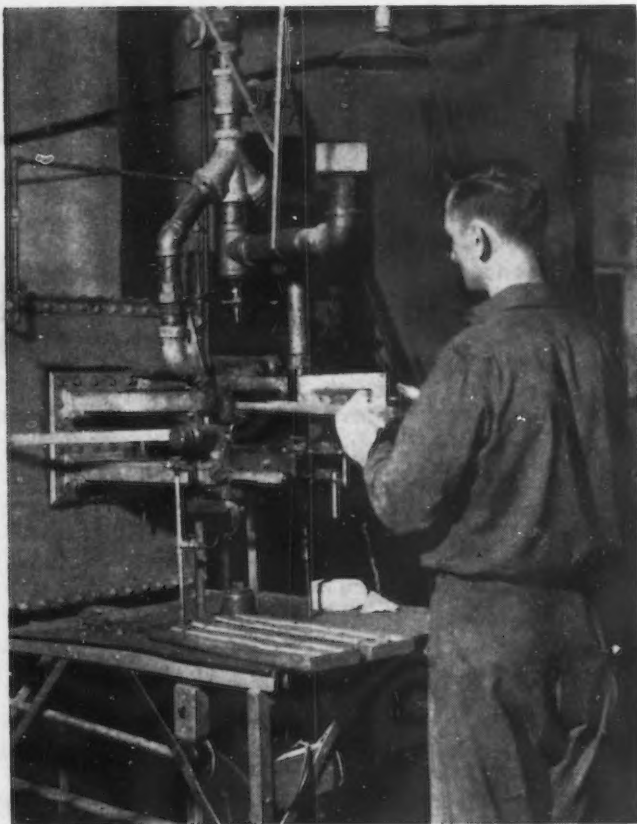
FIG. 12—Flush filling a self-metering bushing die in a Bliss No. 21-B press with a scale, for occasional checking of weights at the left. Courtesy National Molded Products, Inc.

RIGHT

FIG. 13—Bliss-Toledo No. 25 double action cam presses with timed cam bottom action arranged to receive dial feeds for use in automatic briquetting of porous bronze bushings.





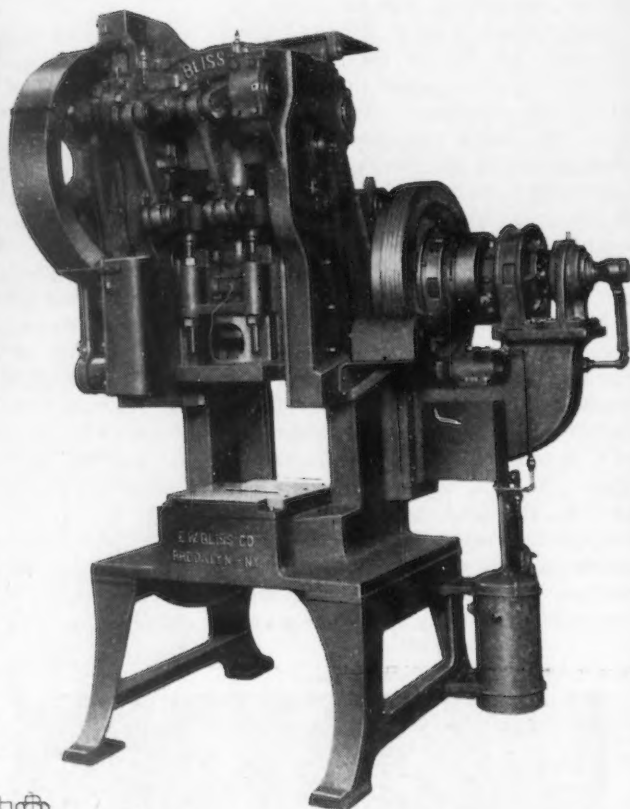


LEFT  
**FIG. 14—**Charging powdered iron compacts in trays into the receiving zone of a hydrogen atmosphere sintering furnace. Courtesy American Electric Metal Corp.

or reducing presses with uniform strokes are used with such multi-shouldered burnishing punches as have been used for solid bushings. For a  $\frac{3}{4}$  in. diameter, the Chrysler Amplex Oilite data book shows a punch with six burnishing shoulders increasing successively in diameter by 0.001 in. up to 0.750 in., plus two more for final size of 0.7503 in. dia.

#### Dense Powder Products

Metal powder products which are dense, as opposed to the porous types



ABOVE  
**FIG. 16—**Double-action toggle presses, used for sizing of porous metal bushings. These also permit use of split molds for other powder briquetting.

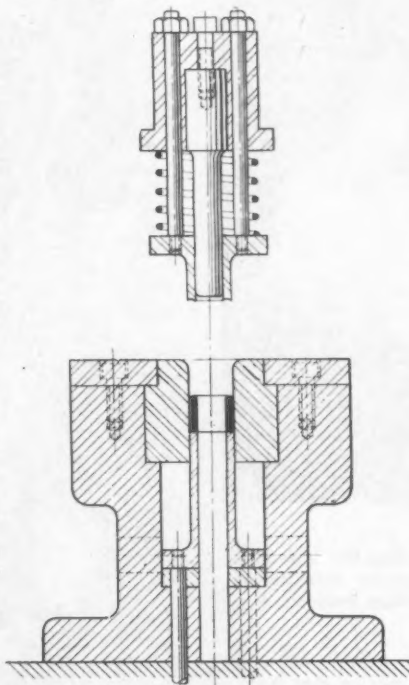
tains only a centering spring pin. Single action presses tooled in this way can be operated at nongear speeds comparable to those in sizing and ironing rolled bronze. The double-action toggle press in Fig. 16 is timed a little differently from the ordinary drawing presses in that an outer or holding slide maintains endwise pressure on the bushing until the punch has traveled through the bushing and back, to strip completely.

The dies, Fig. 15, for sizing to precise dimensions have much in common with other metal sizing or ironing operation dies. Both the briquetting and sizing dies are of substantial construction and for production purposes, Langhammer and Smith<sup>8</sup> advise high speed steels for dies and punches and oil hardening steels for strippers and knockouts. Allowances for sintering contraction and subsequent sizing are suggested as 1 per cent on the briquetting die diameter. They specify dimensional tolerances of 0.0002 in. and superfinished surfaces.

To force porous oil impregnated bushings into motor and frames or other holding members, inclinable presses are used with suitable fixture and punch to assure straight entrance of the bushing. After pressing into position on quantity work, it is often desirable to burnish the bushing for precise diameter and positive alignment. Long stroke inclinable presses

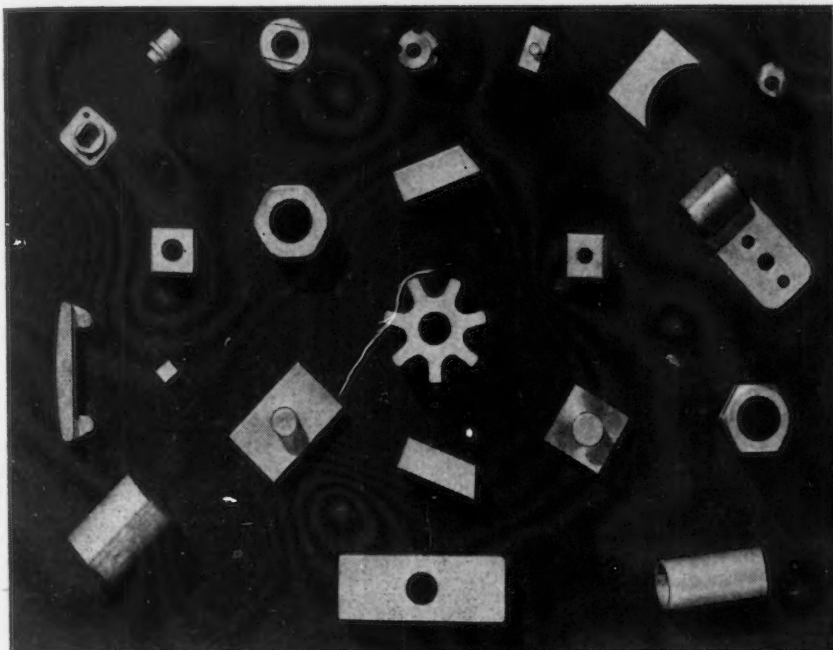
#### BELOW

**FIG. 15—**Detail of dies for sizing pre-formed porous metal bushings, after sintering, in either single-action or double-action mechanical presses with direct connected liftout or cam bottom knockout. (After Langhammer and Smith.)



just discussed, may be divided into two classes: Those products which probably could not be made otherwise as satisfactorily, such as refractory metal wire and sheet, cemented carbide tools, electrical contact materials, etc.; and those parts which can also be made by such methods as die casting, or by precise machining of wrought or cast metal, such as gears and other complex shapes, Fig. 17. It is often possible in powder metallurgy to briquette and sinter a piece to the finished size to tolerances of  $\pm 0.001$  in., so that expensive machining and scrap are entirely eliminated.

Density, especially in the case of



metal powder products, is decidedly important. Upon it depends tensile strength, impact strength, hardness, and ductility, all of which increase with increasing density.

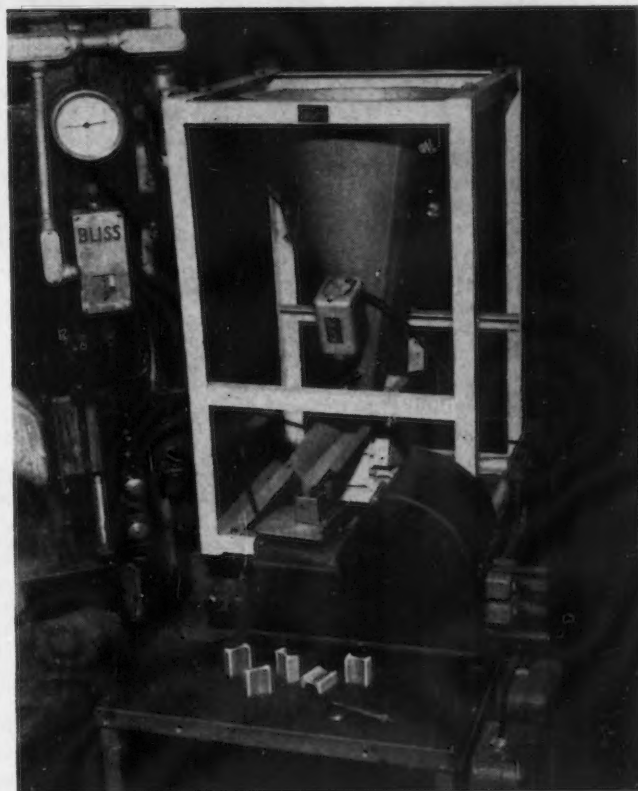
#### Accurate Charges Necessary

A charge of exactly the right amount of powder is especially important in the production of dense compacts to precise dimension. Fig. 18 illustrates a method of weighing the metal powder charge in cups for convenient hand feeding to the die cavity. Here, the nearly pure iron powder has been thoroughly mixed with a small percentage of vegetable binder or stearate (used as a lubricant or plasticizer to lessen interparticle friction and contact with die cavity walls) and placed in the inverted conical shaped hopper. The vibrating hopper and trough conveys the powder to a container on a scale. The scale is arranged with photoelectric cells and relays to stop the vibrators, first on the hopper and then on the trough, to slow down and then stop the flow of powder when a predetermined weight of mix has entered the container.

The operator then places the charge in the die cavity (see Fig. 5), using a profiled scraper for proper distribution. It is important to place the powder as nearly as possible in its final position when filling the die. A typical hydraulic press for such solid compression is the fast Bliss self-contained 200-ton Hydro-Dynamic press, Fig. 19, with hydraulic knockout in the base, adjustably timed to suit. Oil in the tank at the top is the pressure medium with variable delivery pump and motor at the rear.

ABOVE  
FIG. 17—An interesting variety of Compo bronze (powder) and Powdiron shapes. Courtesy Bound Brook Oil-Less Bearing Co.

RIGHT  
FIG. 18—Precise weighing of the powder charge accomplished by combining the "shadow-graph" scale with two light sensitive tubes controlling two vibrators which control flow of the powder. A shadow line on a ground glass window gives the operator a visual check. Courtesy American Electro Metal Corp. and the Syntron Co.



process is related to common progressive forging in double crank presses. The difficulty of obtaining a die material which will stand up both to the temperature of heating and also to the pressures of forming without loss of accuracy leads clearly to the close coupling of the two functions, each with suitable materials which are available. The transfer feed press provides a series of stations close together and enclosable, with the necessary movements. The powder is briquetted at the first station or preferably preforms are delivered to the first station by the conventional friction dial feed, then transferred from one position to the next by suitably shaped ceramic fingers on the feed bars. The initial stations form substantially an automatic furnace with refractory ceramic die blocks and resistance heating contacts. Where greater speed is required, induction

Limiting positions of the quick advance period, the pressing stroke, the quick return, and the knockout (below) are conveniently adjustable. Both pressure switches and position stops are provided to govern the work stroke.

#### Hot Pressing

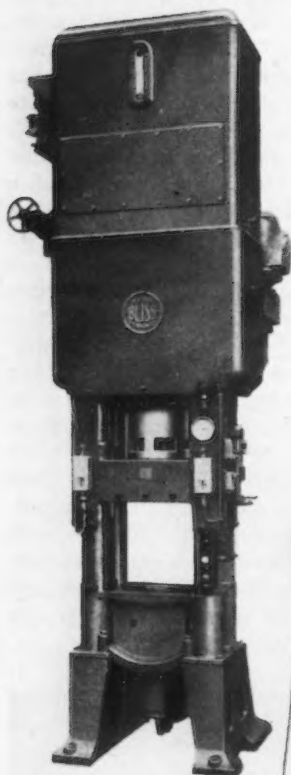
For improved hot pressing the use of transfer feed presses, Fig. 20, has been favorably considered to combine closely progressive heating and dense pressing of powder preforms. The

heating coils could be used. The pressing station and possible restrike station permit the use of high temperature forging steels with hot oil circulation for temperature control. Flame protection in transit or enclosure with Pyrex window and circulated reducing atmosphere is required to minimize oxidation.

#### Press Design Considerations

Press construction for powder compacting requires all the precision and ruggedness of the best metal work-





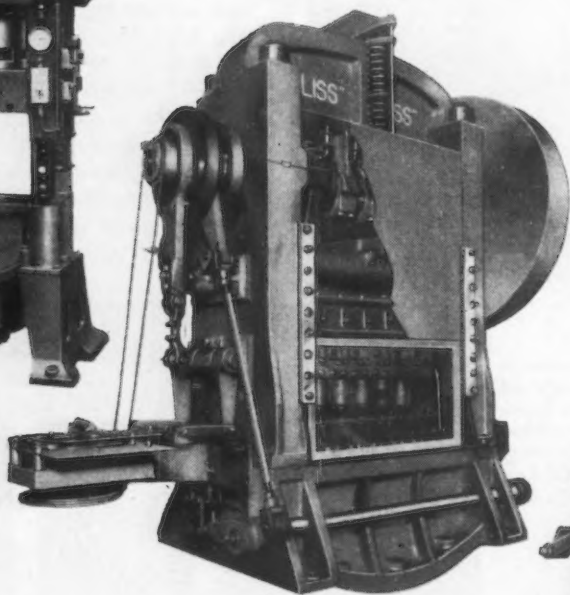
LEFT

**FIG. 19**—Bliss Hydro-Dynamic fast cycle molding press is a compact self-contained unit with its own motor, pump and reservoir. It has an intertimed bottom ram for knockout with such dies as Fig. 6 or for synchronized pressing from below and above.

o o o

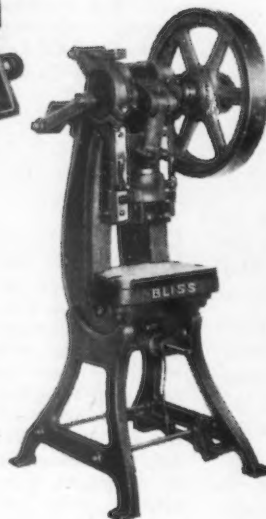
BELOW

**FIG. 20**—For progressive heating and dense pressing of powder preforms this automatic transfer feed press lends itself well to use of refractory molds at heating stations and oil cooled forging type dies.



RIGHT

**FIG. 21**—The bottom dwell period of the plastic curing presses has value to permit trapped compressed air to escape when making powder preforms.



BELOW

**FIG. 22**—Mechanical presses may be arranged with top and bottom movements for simultaneous compressing from both directions and then stripping of powder metal preforms.



ing presses. Die clearances are even closer than in most metal working so that precision gibbing and carefully keyed frames with prestressed tie rods are of particular value on both hydraulic and mechanical types. Fast crank actions contribute to uniformity in compacting. Bottom dwell periods for relief of entrapped air are available as in the presses used for curing plastic materials, Fig. 21. For the smaller sizes, the cut-back or gap-frame construction gives the operator freedom of movement for convenient hand feeding.

While the particular application should always be considered and may readily alter the consideration, practice seems to bear out the choice of mechanical equipment for quantity production for porous compacts. For dense compacts and especially for closed dies where the powder charge cannot be controlled precisely or where other unknowns are present, hydraulic equipment affords close control of working pressures. Timing also is altered more easily in instances where that is advisable. The fast self-contained hydraulics also offer extreme flexibility and fast adjustment where shapes and production problems are varied.

Uniformity of powder compacting may be favored in some cases by opposing motions, differential motions or special timings. Wall friction, tendency of powders to arch in filling and differences in thickness in different areas as in flanged bushings all enter into the problem. The simple solution in Fig. 5 where the die ring is floated on springs is not always practical. In hydraulic presses such as Fig. 19 a bottom cylinder and ram of suitable tonnage capacity may be timed as desired with the top ram. Mechanical presses, Fig. 22, may be arranged with a crank or toggle actuated slide under the press bed, opposing the usual upper slide.

Double action presses are available in many sizes in both mechanical

(Fig. 16) and self-contained hydraulic types, Fig. 23. In the larger sizes both use the keyed housing construction with shrunk rods to hold the frames solid under load. The usual timing is such that the outer slide closes first, possibly pressing some portion of the charge and then holds while the inner slide completes the compacting operation. Duplex presses, which combine two double action presses, one above and one below the bed, are also offered for some applications. In these, independent pumping units for each slide are available to give complete flexibility of relative speed control and timing. Such actions are also advantageous to the closing of split dies for odd shapes or the operation of wedge mandrels for side cores.

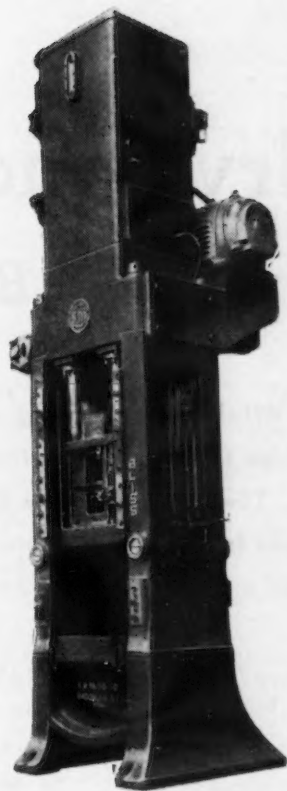
In general, all such dies should be of the rugged construction characteristic of cold forging dies. Often



they require hardened backing or load distributing plates, wedge prestressing in substantial holders or shrunk rings as in Fig. 6. Such die constructions are also advisable in many cases for cold flowing or heavy sizing operations performed in knuckle-joint presses like that shown in Fig. 4. For such heavy sizing in hydraulic presses and often in mechanical presses, it is advisable to furnish hardened size blocks or distance pieces substantially built into the dies to assure precise dimensions of finished parts.

Warnings regarding briquetting dies design have much in common for all powders whether plastic, ceramic, metallic or mixtures of these. Corner radii, fillets and bevels are important, avoiding sharp corners. Feather edges, threads and re-entrant angles are usually impractical if not impossible. Refractory materials in the powder mix are highly abrasive and often require carbide inserts, chrome plating or highly resistant die steels. Reasonable uniformity of section and avoidance of thin flanges or long thin barrels are important. Inserts or backing plates may be molded and sintered in place in many instances.

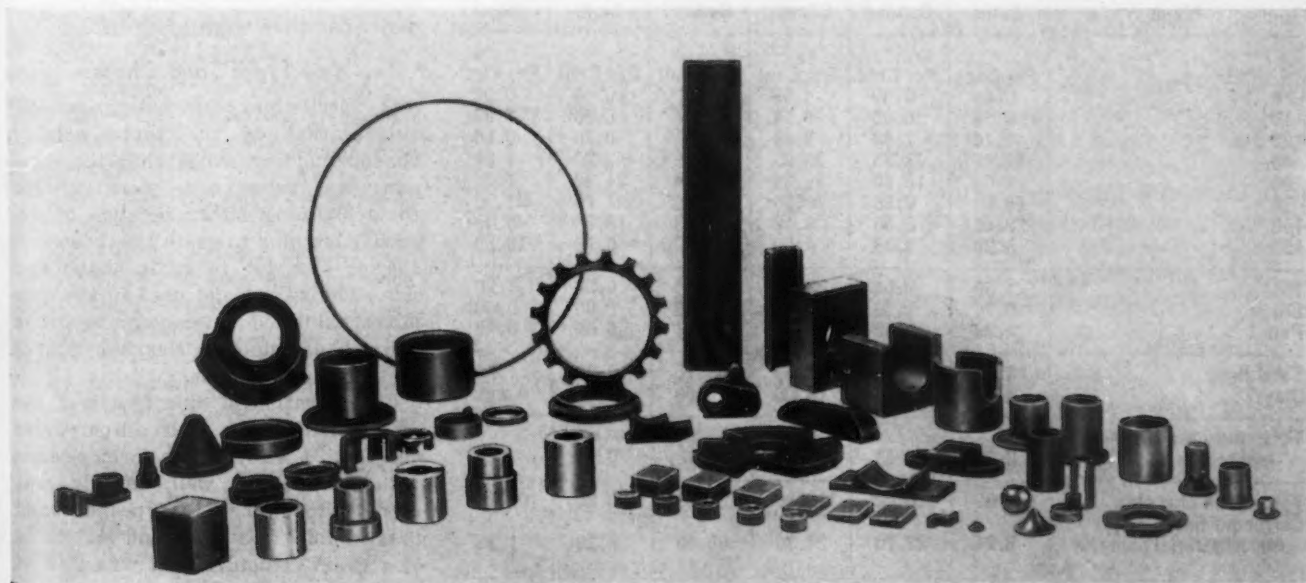
The variety of presses available for the cold and hot compacting operations and the straightening, sizing or cold forging operations after sintering are in keeping with the variety appearing in powder products. Note in Fig. 24 the range in sizes, shapes and relative proportions. Note also that some of the parts shown have proper porosity for filters, others have lesser porosity suitable for long time lubrication while others are substantially solid. Silica, graphite and



**FIG. 23**—Bliss double-action Hydro-Dynamic press with lower liftout attachment. The main or inner slide capacity is adjustable up to 75 tons and the capacity of the outer or holding slide is 20 tons. Duplex units of this sort with double action presses both above and below have advantages for certain applications.

o o o

**FIG. 24**—An assortment of metal powder compacts, dense and porous bearings, filters, friction rings and solid blocks, electrical contacts, pole pieces; from various ferrous and non-ferrous base alloys. Courtesy Unexcelled Mfg. Co., Inc., New York.



carborundum may be included in mixtures for friction clutches and brakes. The materials represented are also broadly significant. Greatest strides have been made with iron powders, copper powders and the bearing mixtures. Unexcelled Manufacturing Company notes that while some fabricators have tried to make alloy steels by the individual addition of powders such as nickel, chromium, molybdenum and the like, practice has shown that an inordinately long heat-treatment is required to achieve a homogeneous material from such mixture. This has somewhat limited the application of powdered metallurgy techniques but such shortcomings can in many cases be alleviated by the use of prealloyed powders. Metal powders may also be supplied with suitable stearates or other plasticizers ready mixed. Improving supply and improving technique are constantly expanding this vital section of the pressed metal art.

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- <sup>3</sup> John Wulff—Powder Metallurgy, A.S.M., 1942.
- <sup>4</sup> Cyril Stanley Smith—American Brass Co.—The Early Development of Powder Metallurgy, A.S.M., 1942.
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# Reclaiming Foundry Sand

## By the Wet Method

**W**HEN the Cincinnati Milling Machine Co. in 1939 sketched a program for the construction of a sand reclamation system for its proposed new foundry, it provided for the eventuality of a basic change in the procurement of types of new sand. The satisfaction which the company now has in its system put into operation four years later can be traced, in no small degree, to this "one step back" in anticipation of the system ultimately installed.

For some time the management had realized that within a period of years, the area available for dumping spent foundry sand would be used up. It was also felt that a monetary saving was to be had if a suitable reclamation system could be designed and built. Then again the use of re-

*... After long planning and research, the Cincinnati Milling Machine Co. decided on the wet method of reclaiming its foundry sand. The authors review the course of development and give the reasons for timely decisions which have led to the present working of a highly compact and money-saving reclamation setup.*

claimed sand would to a great extent eliminate the storage of large quantities of various types of new sand, in order to tide the foundry over the freezing weather which exists at least four months out of the year. The factor of cutting down on rail ship-

By **WILLIAM RENGIERING, CH. E.**,  
*Assistant Foundry Superintendent,*  
and **WALTER HORTH, M. E.**  
*Foundry Plant Engineer,*  
*The Cincinnati Milling Machine Co.*

ments and becoming less dependent on rail traffic situations was also considered.

With these thoughts in mind

a research program was created to find the answers to the following questions:

1. Were the sands then in use in the foundry of such a nature as to lend themselves to economical reclaiming?

2. What characteristics should a reclaimed sand possess?

3. How should a reclaimed sand be reused?

4. By what process can the company best reclaim sand?

It may be noted that these questions were not independent but were definitely related to one another. The first step was to examine the types of sand in use; what they were as new sands and what they were after use.

### New Types Sand Chosen

A preliminary investigation divulged that of the three natural bonded molding sands that the company was using, none were suitable for reclaiming either because of excessive loss due to grain breakdown in use, or else due to grain shape and size. The silica sand used in the core mixes exhibited a tendency to break down badly due to cleavage planes present in the grains.

Consideration of this fact was the cause of the first and all-pervasive decision. It was that the former sands did not reclaim well and it was planned to change to types of sand that would. This new sand had to be of a grain structure that was free of

**TABLE I**  
Screen Analysis of Foundry Sands Showing Relative Amounts of Coarse and Fine Material

Mesh	Old Type Sands				New Type Sands	
	Core	Molding			Core	Molding
	Silica Core Sand	Coarse Natural Bonded	Medium Natural Bonded	Fine Natural Bonded	Coarse Lake Sand	Fine Bank Sand
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
6.....	0.05	0.00	0.09	0.00	0.00	0.00
10.....	0.59	0.05	0.14	0.41	0.00	0.00
20.....	1.14	7.48	3.49	0.91	0.10	0.00
40.....	10.47	43.75	25.95	2.22	3.20	1.60
50.....	0.00	16.50	25.25	2.64	34.30	7.00
70.....	56.90	8.86	19.35	7.00	47.70	27.20
100.....	22.62	5.50	8.42	10.83	13.80	46.40
150.....	3.26	4.38	4.88	12.80	0.70	16.60
200.....	1.50	2.54	3.11	15.55	0.20	1.20
270.....	0.74	1.36	1.43	15.80	0.00	0.00
Pan.....	2.09	9.53	7.85	31.81	0.00	0.00
Total fines.....	4.33	13.43	12.39	63.16	0.20	1.20
Clay.....	4.00	25.00	16.00	20.00	None	None
Total fines (mesh —150) + clay.....	8.33	38.43	28.39	83.16	0.20	1.20
Total silica plus clay.....	104.00	125.00	116.00	120.00	100.20	101.20
Corrected fine (—150) mesh material plus clay..	7.71	22.70	24.30	69.10	0.20	1.20



cleavage planes and also of a rounded form. Thus the first of the above questions was answered.

It was next decided to buy straight "clay free" silica sand in a minimum number of sizes and try to use the same sands in all of the foundry oil sand core mixes as well as in the molding sand heaps. After many experiments the company decided to buy a lake sand for a coarse grained silica sand and a clay free bank sand for a fine silica sand to blend with the coarse sand. Here was the answer to the second of the questions, in that by using straight silica sands in the beginning, the reclaimed used sand must approach the straight new silica sands in cleanliness, grain size, and behavior.

After a series of experiments it was found that bonding clays would produce satisfactory synthetic molding sands when mixed with the silica sands.

Answering the third question — "how should a reclaimed sand be used?" — it was apparent that its reuse in oil sand mixes was possible without requiring extra oil to develop a comparable dry strength since the reclaimed sand was as clean and behaved like the new sand. Also, using synthetic molding sands made from straight new silica sands and bonding clays would permit the reuse of reclaimed sand on the same basis.

Table I shows the screen analysis of the old type sands and the two now in use. It was found in the preliminary work that every type of reclamation process would eliminate most of the material finer than 150 mesh, if the larger sized sand grains were to be thoroughly clean. Hence, all new material finer than 150 mesh was considered as loss after one use. It may be also noted that all the old type sands have a considerable percentage of loss as compared to that of the new sands.

#### Search for New Method

In answer to the fourth question, namely — by what process can the sand be best reclaimed?—three methods were open for consideration:

1. Dry scrubbing followed by air separation.
2. "Burning off" the sand at high temperature followed by dry scrubbing and air separation.\*
3. Wet scrubbing the used sand followed by wet classification to remove unwanted material and then drying the cleaned sand before storage or reuse.

In the research work on each of

\*See the article: "Core Sand Reclamation by the Thermal Method," THE IRON AGE, Dec. 17, 1942, p. 43.

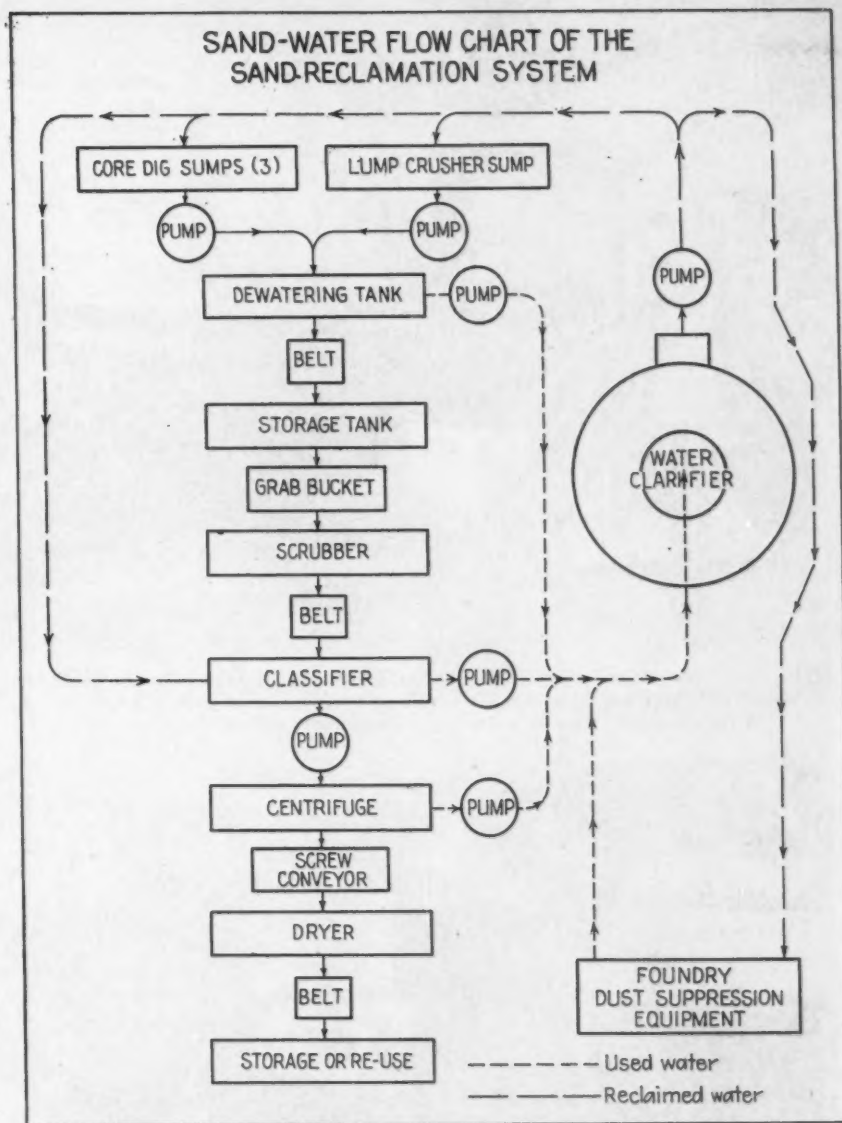


Fig. 1—Sand-water flow chart of the sand reclamation system.

these methods the main goal was to produce a reclaimed sand which was as good or better than new sand.

At the same time thought had to be given to processing costs. Any sand reclamation project can be feasible only if the entire cost of reclamation per ton is materially less than the delivered price of the new sands per ton.

The operating costs of a sand reclamation system involves many factors, as for example:

1. Depreciation
2. Interest
3. Taxes
4. Ground rent
5. Overhead
6. Service charges—heat, light, air, etc.
7. Power (processing)
8. Fuel (processing)
9. Water (processing).
10. Labor (supervision, direct and indirect labor)
11. Maintenance (parts and labor)

12. Loss of reclaimed material either through intentional rejection or through inefficiencies of equipment used in the process.

On the other hand, credit against reclamation costs may be taken as follows:

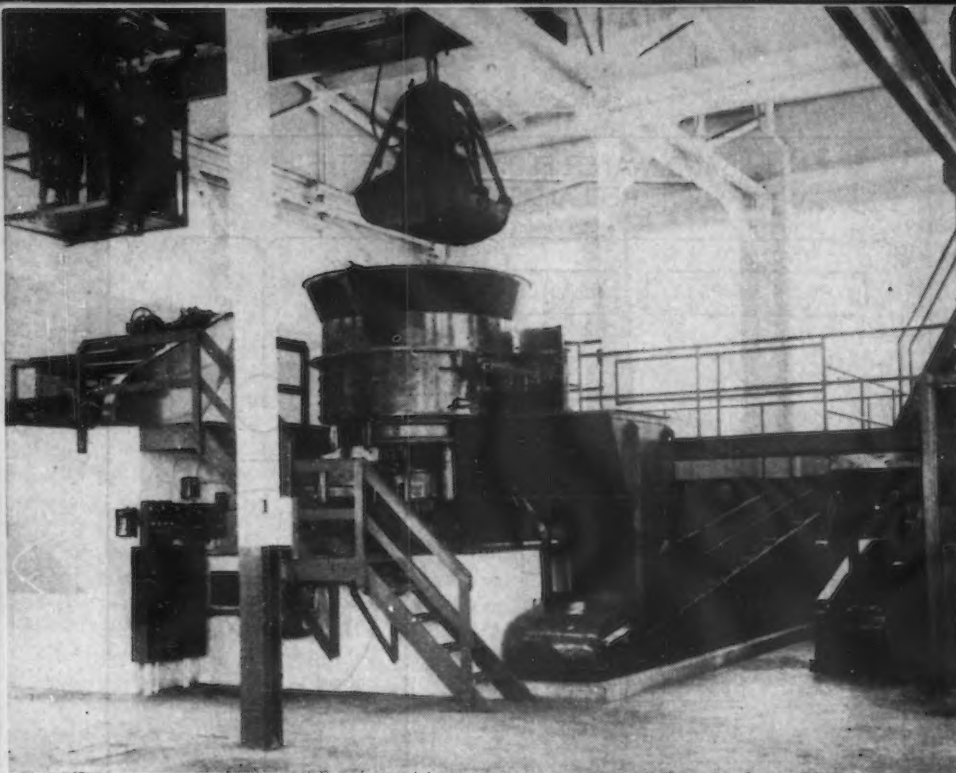
1. If the reclaimed material is put back in bins ready for reuse, handling charges incurred to put new material in same place may be credited.

2. Handling charges previously involved in hauling reclaimable material to dumping areas as well as cost of procuring and maintaining dumping areas may be credited.

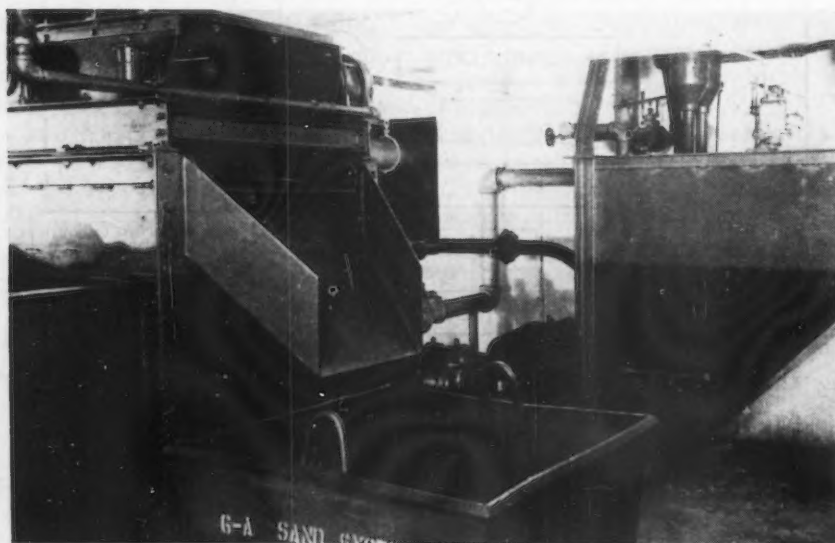
#### Experiments Made

A summarization of the work on these problems by the time the foundry engineering group assembled in June, 1939, to design the new foundry was about as follows:

1. All cores both large and small used in the old foundry had been made from core sand mixtures containing



**FIG. 2**—A view of the inside of the sand reclamation building, showing the dewatering tank at left, grab bucket over muller and belt conveyor which carries the muller sand to the classifier. Sand in water suspension enters in pipes at extreme left.



**FIG. 3**—The good sand is discharged into the tank shown in the background. To the left is the sump of the lump crushing unit. Foreign matter falls into the bucket.



**FIG. 4**—Concrete trench containing pipes that carry water and sand to the centrifuge and the reclaimed water from the centrifuge.

coarse lake and fine bank sands, since June, 1937. This used core sand was being sent to the dump.

2. Sufficient work had been done on synthetic molding sands to prove the practicability of operating the proposed new foundry and producing all of the various types of castings with synthetic molding sands.

3. Very many tests, on an experimental basis, had been made towards reclaiming used core sand by each of the three methods previously outlined. It was felt that the wet method of reclaiming promised to produce a reclaimed sand nearest to new sand in properties. However, in view of studying further the relative operating cost data and unexplored possibilities of the other methods the engineers had not arrived at a final decision.

Research work continued on these problems throughout the design and construction period, and when the new foundry started operations in December, 1940, all molding sand used in the various departments was synthetic and the core mixes were made from the same base silica sands as were the molding sands.

In addition the spent core sand from the core knockout was pumped hydraulically from the knockout points in the shop to a dewatering tank just north of the foundry building. This used core sand was to be piled in the foundry yard awaiting the day of the reclamation system.

#### Wet Method Selected

Later the wet method of reclaiming foundry sand was finally decided upon for the following reasons:

1. Wet scrubbing and classification produced reclaimed sand with properties nearest those of the sand when new.

2. Handling sand wet permitted pumping instead of using long belts and vertical elevators for conveying from one point to another.

3. The wet method eliminated need for dust suppression equipment.

4. Based on a study of the equipment already in use for pumping core sand, maintenance costs for maintaining wet reclamation equipment was calculated to be lower than for that of a dry system.

5. Process water reclamation was feasible and would produce a further economy.

Particular thought was also given to the known inherent variations in the quantity of used core sand which would be delivered from the foundry to the reclamation system during foundry operations.

In order for the proposed reclamation system to run at full capacity in the face of the above conditions, it



became necessary to provide an accumulation bin at a suitable point in the system so that the foundry could operate at a rate independent of the reclamation equipment.

#### Non-Critical Materials Used

Being unable to purchase a suitably designed reclamation system in one unit from any of the foundry equipment builders, the company decided to design and erect its own system.

Accordingly such designs were completed and the equipment selected and building operations began in the fall

FIG. 5—The centrifuge where the sand is continuously separated from the water.

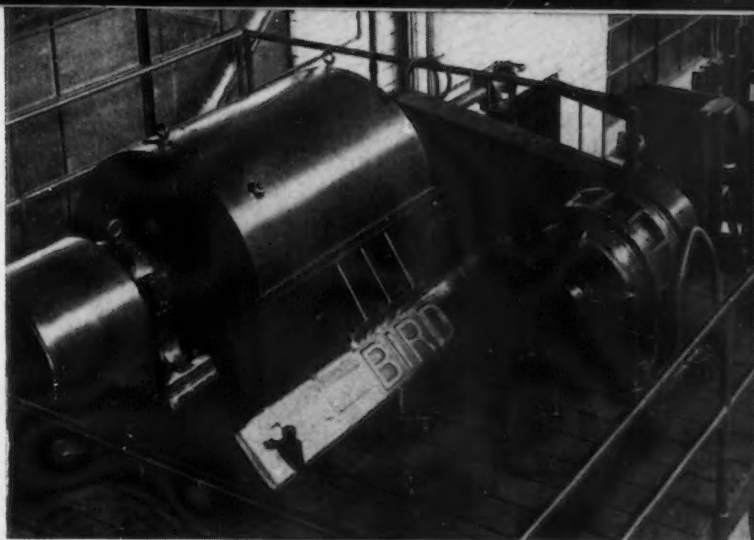


FIG. 6—The steam heated rotary dryer where the partially dried sand from the centrifuge is completely dried. Discharged dried sand on belt in foreground.

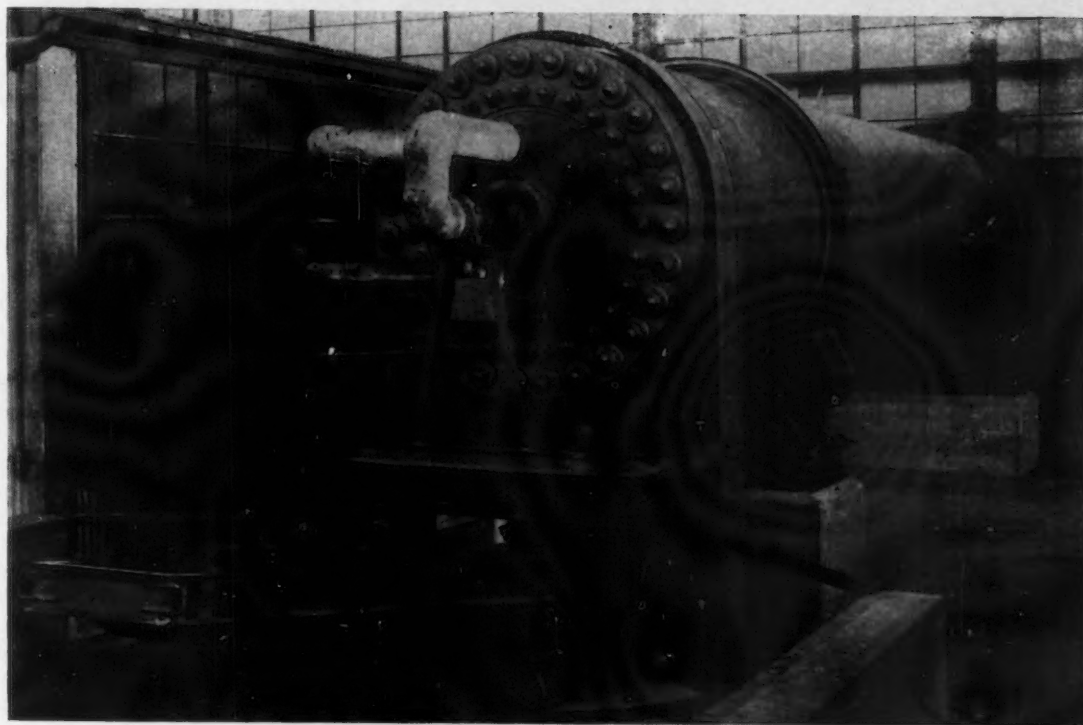


FIG. 7—Top side view of the large unit of the water clarifier. The pipe at the left center contains dirty water pumped into the water clarifier from the sand reclamation system foundry dust collectors and the core digging operations.



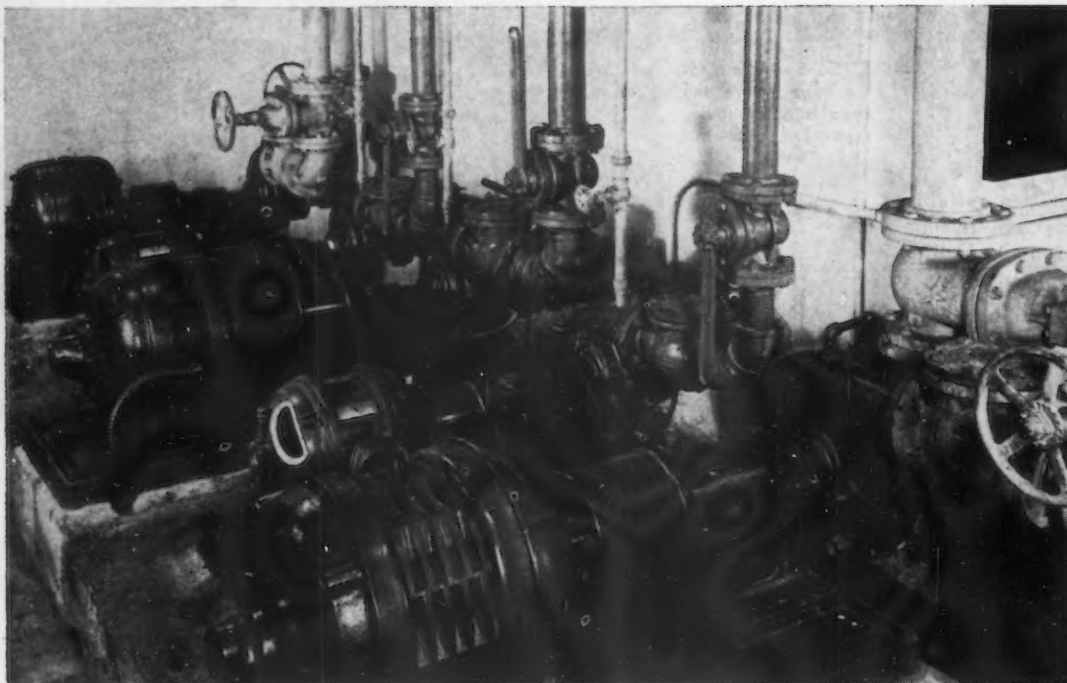


FIG. 8—The pumping system that distributes the reclaimed water to the various processing stations of the foundry.

of 1942. The building was finished in the early spring of 1943. Lack of materials and priority restrictions resulted in the use of as much reclaimed and also non-critical building and construction materials as possible.

The roof trusses used for the building, for example, once supported a portion of the roof of the core room in the old foundry; similarly for building columns and crane runways. All pipe and miscellaneous steel was

reconditioned material from the old foundry. All motors were bought from second-hand dealers.

The complete reclamation system as built provides for the following operations:

First—the preparation and delivery of used core sand from the three core digging stations in the foundry to the reclamation system.

Second—lump crushing and magnetic separation for boxes of material delivered for further processing to the reclamation building, by the shop monorail equipment. This box material may consist of floor sweepings or loose sand mixed with sand lumps and tramp iron, rods and gagers. Such material is processed by magnetic separation, lump crushing and screening, and the usable sand portion pumped to the sand reclamation unit.

Third—processing the delivered used sand by scrubbing, classification and drying so that it can be reused.

### Saving The Water Too

As the sand reclamation system took shape, from the standpoint of economy and conservation, the necessity for some type of water reclamation became apparent. Accordingly, a water clarifier was installed. This unit, in addition to reclaiming process water from the sand reclamation also reclaims water from the foundry wet dust collection system. Such reclaimed water is handled in a piping system entirely separate from new water.

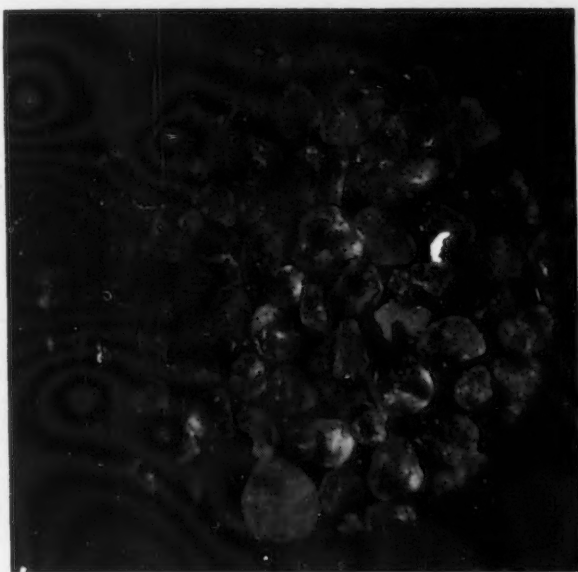
Essentially the system is comprised of these two units:

(1) A scrubber to clean the grain sands,

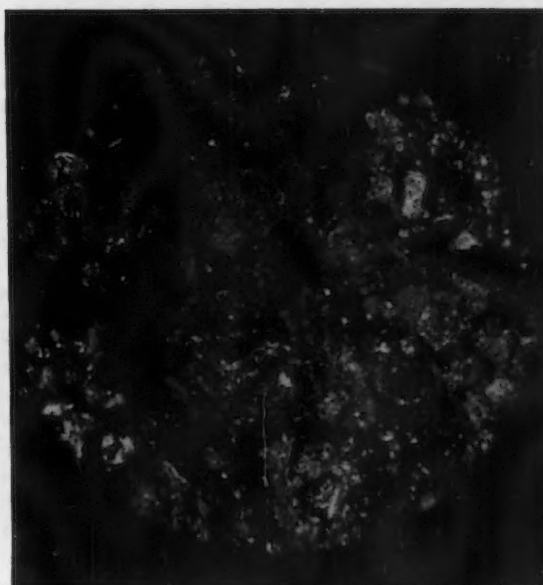
TABLE II  
Comparative Physical Properties of New Sand Vs. Reclaimed Sand  
In Test Mixes

Test No. 1	Core Mixes Made From	
	New Sand	Reclaimed Sand
Composition:		
New sand, lb.....	33	33
Reclaimed sand, lb.....		2 1/2
Raw linseed oil, per cent.....	2 1/2	
Physical Properties:		
Dry tensile strength, lb. per sq. in.....	175	175
Dry permeability.....	180	200
Test No. 2	Core Mixes Made From	
	New Sand	Reclaimed Sand
Composition:		
New sand.....	33 lb. 7 oz.	33 lb. 7 oz.
Reclaimed sand.....		12 oz.
Bonding clay.....	12 oz.	1 lb. 4 oz.
Silica flour.....	1 lb. 4 oz.	2 1/2 oz.
Cereal binder No. 1.....	2 1/2 oz.	2-1/10 oz.
Cereal binder No. 2.....	2-1/10 oz.	320 c. c.
Linseed oil.....	320 c. c.	
Physical Properties:		
Moisture, per cent.....	4.0	4.0
Green compression strength, lb. per sq. in.....	1.05	0.9
Dry permeability.....	115	120
Dry tensile strength, lb. per sq. in.....	245	255
Hot strength (2000 deg. F.), lb. per sq. in.....	140	125
Maximum expansion (2500 deg. F.).....	0.025 in./in.	0.022 in./in.





**FIG. 9**—Photomicrograph of new core sand (magnification 19X). This sample taken from a mixture of 77 per cent coarse lake sand and 23 per cent fine bank sand.



**FIG. 10**—Photomicrograph of used core sand (magnification 19X). This is the 77 per cent coarse sand plus 23 per cent fine bank sand. Note small particles adhering to grains, also those lying loosely between the grains. The general dullness of the grains themselves can also be observed.

(2) A classifier to eliminate the unwanted material scrubbed from the good sand grains.

The remainder of the reclamation system consists of units to convey the sand and water to and from the scrubber and classifier, as well as to dry the sand for immediate reuse. In the flow chart, Fig. 1, the path of the sand to be reclaimed has been plotted from its point of origin through the various stages of processing and finally into the storage bin for reuse.

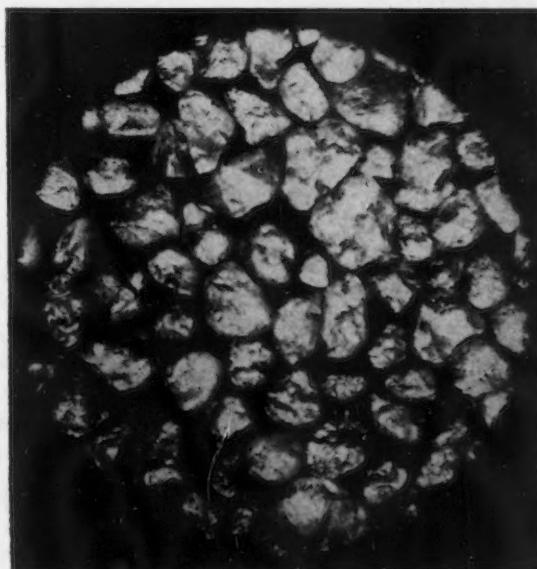
The used core sand removed from the castings at the core digging stations drops through an opening in the floor of the core digging room, to a vibrating screen with  $\frac{1}{8} \times \frac{1}{2}$  in. punched openings. This screen is flooded by water sprays. That portion of the material which passes through the openings in the screen drops into a sump, in which the water level is maintained with the aid of float valves, and is pumped as a suspension of sand in water for 300 or 400 ft. to the sand reclamation system. The material not passing through the screen, consisting of lumps, rods and gagers, rides over the end into a container and is later delivered to the lump crushing unit.

In Fig. 2 is a view of the first floor of the interior of the building showing on the extreme left the dewatering tank with the sand conveying pipes rising vertically to discharge into it. Overhead is a traveling crane which carries the grab bucket for loading the scrubber or muller shown

directly below it. To the right of the scrubber is the hopper into which the scrubbed sand is discharged onto an inclined belt which delivers the scrubbed sand to the classifier. To the extreme right of the picture may be seen the equipment of the lump crushing unit.

The sand in water suspension is conveyed through pipes which rise vertically at the dewatering tank and is discharged on a vibrating 10 mesh screen, above the tank. This screen

**FIG. 11**—Photomicrograph of reclaimed sand (magnification 19X). This is the used core sand after being treated in the reclamation system. Note absence of fine particles and lustre of the grains.



serves to remove very small nails, iron shot and also small hard sand and clay pellets which have no reclamation value.

The machinery in the dewatering tank consists of slowly moving flights which are chain driven and which drag the "settled out" sand up an incline and over the end to a short belt, which in turn drops the dewatered sand into the 200-ton accumulation bin.

The dewatered but still very wet sand is picked up from the accumulator bin with a grab bucket, which holds a 1-ton batch, and is dropped into a muller for a thorough scrubbing of 5 min. duration. After scrubbing, the muller contents are discharged into a hopper.

Below the muller hopper, a moving belt discharges the sand at a measured rate into the entrance end of a classifier. In this machine the dirty sand is carried by water progressively across classifier cells where the unwanted material is rinsed out and the good, clean sand settles to the bottom of the cells. From there it is discharged into a sump and is pumped away.

The photo, Fig. 3, was taken in the basement of the building. To the right center is shown the sump below the classifier in which the classified sand is received and from which it is pumped to the centrifuge 700 ft. away. To the left is the sump of the lump crushing unit. From here the sand from the crushed

lumps is pumped to the dewatering tank. Note the refuse box below the lip of the screen. Oversize and unwanted material is collected in boxes similar to this one and is disposed of by sending to the dump.

At this point, it should be emphasized that the quality of the reclaimed sand is dependent solely upon the thoroughness with which it has been scrubbed and classified. All other operations in the sand reclamation system are purely contributory.

The classified sand is pumped as a suspension of sand in water through a pipe, over 700 ft. long, to a continuous centrifuge machine. This pipe is accessible and yet protected from the elements. Fig. 4 shows the concrete trench provided. Several of the heavy wood covers have been removed to show the pipe which conveys the sand water suspension and the pipe which conveys the used water back from the centrifuge.

The classified sand is removed from the sand-water suspension in the continuous centrifuge, Fig. 5, which is located inside the foundry building near the sand bins. Note the machine is sitting above the shop floor level on heavy concrete piers. The lower portion of the piers forms a sump in which the conveying water is collected after removal from the sand. From here the used water is pumped to the water clarifier.

In Fig. 6 is shown the steam-heated drum dryer, which is located in the west end of the covered foundry yard. The centrifuge is inside the foundry building at the rear of the dryer. The centrifuged sand is fed into the drum dryer by means of a screw conveyor which passes through the window section of the foundry building. To the rear and above the drum dryer may be seen the stack through which the moisture driven from the drying sand is carried away, and discharged above the roof. In the foreground is the

temporary receiving pit in which the dried sand is deposited by the short belt shown under the discharge end of the dryer. This dryer is heated by steam, and pressure controls on the steam supply permit drying the sand either to complete dryness or to any desired final moisture content.

### Reclaimed Water Cycle

The flow chart also shows how the water clarifier becomes the receiver for all the used process water and feeds out clean reclaimed water back into the system for reuse. The sludge which is settled out of the dirty water during the cleaning process is continuously pumped away to a disposition area.

Cleaned process water is fed into the core dig sumps, lump crusher sump and into the classifier. Used, dirty water is withdrawn from the sand system at the dewatering tank, classifier overflow and centrifuge machine. In addition the requirements for clean water for the Rotoclones is met, and after use the dirty water is returned again for cleaning and reuse.

Fig. 7 is a close-up view of the water clarifier and the pipe which conveys the used water to the center tub. Below the surface of the water and driven by the machinery located on the center pier are the sweeps and agitators. The clarifier is located in a small park area to the north of the reclamation building.

Some of the pumps used in the operation of the system are shown in Fig. 8. The pumps at each end carry reclaimed water to the foundry dust collectors, core digging and sand reclamation units. The three center pumps carry water and sludge to the water clarifier.

### Conclusions

A comparison of new, used and re-

claimed sands is evident from the photomicrographs of sand taken in silhouette. Fig. 9 is a blend of new silica sand as used in the core mix when made from new sand. Fine material adheres to and lies between the grains. The photomicrograph, Fig. 10, shows the sand blend after one use, and ready for reclamation. The reclaimed sand after passing through the reclamation system is shown in Fig. 11. The outline of the sand grains is free from adhering small particles, nor is fine material visible between the grains. According to these photographs, this reclaimed sand should possess characteristics comparable with those of the new sand.

In the period that this sand reclamation system has been in operation all reclaimed sand has been reused as the equivalent of new sand.

Through two tests (see Table II) a comparison of the physical properties of reclaimed sand with those of the original new sand can be made. In the first test, the respective sands in equal amounts were mixed with like quantities of linseed oil and water and mulled. Test specimens were rammed and baked. The results of this test indicated that the reclaimed sand is as clean or more clean than new sand, since the dry tensile tests are equivalent and permeability is higher.

A second test was similarly made, but this time, all the other ingredients regularly used in core mixes were added in equal amounts in addition to oil and water. Again dry strengths and permeabilities are favorable by comparison.

In conclusion, it might be interesting to note that the reclamation system has reclaimed 13,500 tons of used sand over a period of 12 months. In addition, the water reclamation system has saved approximately 65,000,000 gal. of water in the same period.

## Heat Distortion Resisted by New Plastic

**A**THERMOPLASTIC characterized by the possession of a heat distortion point above the boiling of water, has been announced by the Monsanto Chemical Co., St. Louis. The new plastic, known as Cerex, has already found wide use in military electronic equipment because of its unusual ability to resist heat, its satisfactory electrical insulating properties and high rigidity. Its heat-resistant qualities particularly should make this plastic in demand for many industrial and household applications.

Cerex is readily moldable in standard molding machines. The factor of heat resistance is not accompanied by the necessity for higher molding temperatures and no plasticizer is required by this resin for formulation into moldable compounds. In addition to the property of dimensional stability, flexural strength of about 13,000 lb. sq. in. is indicated.

Electrical properties of the new material are satisfactory but not as good as polystyrene and Styramic HT

at very high frequencies. Dielectric strength is high (over 500 volts per mil). Surface and volume resistivity are not affected by prolonged immersion in water. Maintenance of electrical properties is assisted by its low water absorption.

Cerex has been subjected to boiling sulfuric acid solution without showing signs of attack, which points to usefulness as a tank liner or utensil in chemical and photographic work.



# Platers Discuss Industrial Finishing Methods

**... The increased use of electroplating and the contemplation of postwar problems brought the largest attendance to the annual conference of the American Electroplaters' Society. The 1200 attending devoted their time to sessions on hard chrome, porous chrome, chromate treatment of zinc and anodizing.**

THE 32nd annual conference of the American Electroplaters' Society was held in Cleveland, Ohio, June 12 to 14. The attendance at this meeting broke all records with a total of over 1200 registrants.

Like the 1943 meeting, most of the program was devoted to finishes for war products: Hard chrome, porous chrome, chemical treatments for zinc plate to prevent the formation of cor-

rosion products, anodizing and coloring of aluminum. Plating on plastics and electroforming were also described.

posure to temperatures above 500 deg. F. Efforts are being made to substitute zinc, which is now quite free for essential uses, for cadmium plating wherever practicable. Zinc furnishes at least as good protection of steel against corrosion as cadmium but zinc is more subject to formation of bulky white corrosion products. Application of various chromate films retards this corrosion of the zinc and thereby permits its use for many purposes. Valuable suggestions on the substitution of zinc for cadmium are contained in Conservation Directive 2B and Conservation Bulletin No. 6A, both issued by the Operating Committee on Aircraft Materials Conservation.

High-carbon steel parts such as springs or bolts that are subjected to repeated stresses are likely to be rendered brittle by pickling and plating operations. Heating to about 200 deg. C. (392 deg. F.) is regularly prescribed for such plated parts.

The scarcity of tin, which is likely to continue for some time after the war, has led to the installation of numerous tin plating lines to coat strip steel used for food containers. The chief advantage of electroplating over hot dipping for this purpose is the ease of depositing much thinner coatings of tin. In normal times, most of the regular hot dip tin plate had a tin coating of 2 lb. per base box, equivalent to about 0.00012 in. of tin. It is not practicable to reduce this to below 1.25 lb. per base box by dipping. However, it is now a regu-

## War's Effect on Electroplating

"ELECTROPLATING and the War" was discussed by Dr. William Blum of the National Bureau of Standards, Washington.

The great changes that have occurred in the electroplating industry during this war have been brought about by (1) reduction or elimination of the production of countless plated articles normally used by civilians, and (2) the large scale production of implements of war in which plating plays an important part, either (a) because steel is used in place of non-ferrous metals and must be protected against corrosion, (b) to prevent acceleration of corrosion by dissimilar metals, or (c) because, by plating, specifically desired properties can be conferred on the surface. These two changes have roughly compensated for each other, so that the total areas now plated are nearly, if not fully, equally to those in peacetime, even though the various metals used in the coatings are not applied in the same proportions or for the same purposes as formerly.

Scarcity of certain coating metals has curtailed their use in plating but scarcity of nonferrous metals has led to applications of plating to protect the steel that is used as a substitute.

Both metals and manpower must become more available before any large scale resumption of plating on civilian goods is possible.

The chief metals now used in plated coatings are cadmium, zinc, lead and tin for protection against corrosion, and chromium and silver (with lead and indium) for resistance to wear. Silver and gold are being plated on radio parts where a surface of high conductivity is required for high-frequency currents. Copper bus bars are silver plated to reduce the resistance at contacts. Nickel plating is used only for those few purposes where it is essential. Copper is now permitted for intermediate coatings on many essential products but the amount used is not large. Rhodium plating is used where high reflectivity and tarnish resistance are required.

Of these coating metals, the most critical are cadmium, nickel and tin, which are classified by the War Production Board in Group I, as "insufficient." The use of cadmium is therefore restricted to those applications that require (a) good protection against corrosion of steel, (b) small dimensional tolerances, both initially and when subject to corrosion, (c) good electrical contacts, and (d) ex-

lar practice to apply by plating 0.5 lb. per base box (0.00003 in.), thus effecting a great saving in tin.

The indications are that in the post-war period electrolytic tin plate having somewhat thicker coatings than at present will have a definite usefulness but will by no means entirely replace hot-dipped tin coatings. Consideration is being given to the post-war conversion of some of the tin plating lines to plating strip steel with zinc or lead.

### Lead Coatings

The former limited supply of zinc (now classified in Group II) as "sufficient") has promoted study of lead coatings, both hot-dipped and electroplated. In spite of the fact that lead coatings do not entirely protect steel that is exposed in pores or scratches, some ASTM tests indicate that if the coating is reasonably heavy, the corrosion of the steel does not penetrate deeply, that is, the flaws are apparently sealed by the products of corrosion.

Reduced demands for certain types of ammunitions have made copper and brass more available for cartridge cases and one-cent coins for example, and hence have decreased the demands for zinc plating. Similarly ferrochromium, used in making chromium alloy steel, is now more plentiful (Group III, available for essential uses) and the latter is used to an increasing extent for such items as tableware. On the other hand, chromium chemicals such as chromic acid are now listed in Group I, largely because their applications in paints, chromate films and hard chromium coatings have so greatly increased, while facilities for their manufacture have not been equally expanded. Sodium cyanide is now also listed in Group I.

The substitution of steel for brass cartridge cases necessitated application of protective coatings. The two coatings that proved most satisfactory were (a) zinc plating and (b) baked phenol formaldehyde varnishes. Each had advantages and limitations. Zinc coatings protected the steel against corrosion, even when severely abraded. However, the zinc developed white corrosion products, especially where the zinc was in contact with the copper bullet jacket. Various types of chromate finishes on the zinc were found to retard this corrosion of the zinc, but they did not entirely prevent it in scratches or in contact with copper.

The baked varnishes furnish very good protection against corrosion of the steel, provided the latter is not

exposed through pores or scratches. At such points the steel will corrode in severe atmospheres.

### Plated Tableware

The scarcity of nickel and copper has prevented manufacture for military or civilian use of tableware made with the "nickel silver" base commonly employed. Service tests of plated steel tableware showed that the greatest cause of failure was the abrasion produced in washing the ware under camp conditions. Chromium coatings directly on steel flatware and on mess trays yielded good service, even though the coatings were porous and permitted rust in a salt spray. Composite coatings of copper, nickel and chromium also appeared promising, while silver was most easily abraded.

The greater availability of ferrochromium has permitted production of most of the tableware for the armed forces from chromium steels, and in some cases from nickel-chromium steels in frozen inventories. Similarly, stainless steel and aluminum are now available for mess kits and canteen cups and have eliminated the use of zinc plating which was never wholly satisfactory for such items.

Although some examples appear to show that for many purposes plating was useful only as a makeshift, the demands for many plated items for military use have increased, because plating is the most satisfactory process for such purposes. A large proportion of the articles being plated in 1942 are still being plated, including airplane parts, signal mirrors, hardware and tools of all kinds, and all sorts of equipment used in the construction and operation of camps and ships. When brass was more scarce, plated plastic buttons were successfully used. Steel lamp bases and sockets were plated with brass. Many new uses for electroforming have been developed. Nickel and chromium plating are used for building up worn or undersized parts.

The diversity of interests and gov-

ernment agencies have naturally led to some confusion and contradictions in requirements and specifications. Fortunately this situation is being rapidly corrected through development of general specifications and through efforts to have them used by all interested agencies. A good example is "U.S. Army Specification No. 57-0-2C," adopted Dec. 11, 1943. This covers "Finishes, protective, for iron and steel parts," including electroplated coatings of zinc, cadmium, nickel, chromium and lead; phosphate coatings, and oxide black coatings. Other important specifications are AN-P-32, "Army-Navy Aeronautical Specification, Plating, Zinc"; and AN-QQ-P-421A, "Army-Navy Aeronautical Specification, Plating, Cadmium."

The most general requirement is the thickness of the coatings. Most commonly the "minimum thickness on significant surfaces" is specified, but occasionally the average thickness is defined. The great usefulness of the magnetic methods is illustrated by the fact that in the past two years the Bureau of Standards has calibrated over 1000 instruments for this purpose, almost all of which are used on military supplies.

In order to make the salt spray test more definite and reproducible, efforts are now being made by representatives of the government, industry and technical organizations to draw up requirements for a "standard salt spray test," in which all the conditions of operation will be defined.

Review of the past few years shows that the electroplating industry has not only taken an active part in the production of essential military equipment, but what may be equally important in times of rapid change, it has acted as a "reserve" ready to step in on short notice to meet shortages of the materials normally used. The ability of the plating industry to meet the new and increased demands of the war justifies the conviction that plating will play a large part in the years to come.

## Depositing Metallic Coatings on Plastics

A PAPER on "Plastics and Plating on Plastics" was read by Harold Narcus, chief chemist, Plating Processes Corp., Holyoke, Mass.

At the present time the two main purposes for metallizing plastics are, first, to render the plastic a suitable substitute for critical and strategic metals and, second, to produce an article which has the inherent properties of plastics with the desirable properties of metals. The deposition

of metallic coatings on plastics also allows the use of certain plastic materials in a particular product which ordinarily could not be utilized. For example, mixed scrap plastics of one certain type but of a plurality of colors can be ground and remolded into the desired shape of the product and then plated, thus making use of idle scrap. Furthermore, the undesirable properties of the plastic such as its absorption of oils, solvents and mois-



ture are eliminated by the proper metallic deposit. Swelling or distortion of the base organic material is thus prevented. Plating increases the heat and impact resistance, dimensional stability of the plastics and, hence, the rigidity of the original plastic part is increased. Probably the outstanding advantage of this type of plating is the greater corrosion resistance of a metal deposit when it is applied on a plastic material than on the usual metallic base. There is no electrolytic action, as between dissimilar metals in the conventional type of plating.

The metal plating of plastics has opened up a vast new field in electronics and electricity. Light metals are being replaced by plated plastics in aircraft for the various radio and shielding devices. Frequency modulation and television antennae are improved in their performance since the reduction in weight permits a larger diameter tube or rod to be used in the element increasing surface area and, hence, pick-up performance.

Available for metallization of plastics are five principle methods, each with its own particular advantages and faults:

1. The varnish-conducting powder methods such as the use of the wax-graphite or plumbago combinations or lacquer-copper powder or the shellac-silver sulphide method.
2. Metal spraying method.
3. Cathode sputtering.
4. Metal evaporation.
5. Chemical reduction.

The first method, using varnish-conducting powder, oldest of all the procedures, produces good adherent deposits but it is not very suitable for work done on a vast production basis because of the time involved in varnishing and powdering. Also, uneven deposits result, making it unsuitable for reproducing fine detail.

The metal spraying gun, is objectionable because of the granular or "sandy" effect. If the gun is held too close the heat developed may either burn or soften the plastic. If the gun is held too far away the "sandy" effect is exaggerated.

The cathode sputtering method, although gaining in prominence is very costly and is difficult to use for practical production purposes. The plastic part acts as anode in a vacuum chamber opposite the cathode which is made of the metal, such as gold, silver or aluminum, to be sputtered. Under a high vacuum, a charge of 10,000 to 20,000 volts is put on the electrodes and the metal is literally torn out of the metallic cathode and de-

posited on the plastic. The equipment needed is expensive and there is waste of metal. It is used in record making and in the manufacture of tinsel and gift-wrapping paper. Silver-coated cellophane is made by cathode sputtering.

Metal evaporation is similar to



MAURICE R. CALDWELL

President, American Electroplaters' Society

cathode sputtering. A vacuum chamber is used to house the plastic work and the metal to be evaporated is made in a filament form. This filament is heated to incandescence by an electric current. The evaporated metal condenses like steam on the cool plastic, thus coating it. This process is also expensive but is used to produce metallized rayon coated with aluminum.

### Chemical Reduction Method

The last method, namely the chemical reduction process, is probably best adapted to a production setup, is more economical, gives most uniform results and is easier to manipulate, requiring no expensive equipment. The basic procedure is the application to the plastic surface, after proper preliminary treatment, of a highly conductive and strongly adherent bond coat, usually using an ammoniacal silver solution and a suitable organic reducing agent, followed by an intermediate layer of copper or silver and finally a top layer of the desired metal such as chromium, nickel, gold, silver, cadmium, zinc and iron.

In order to deposit any metal on a plastic base material or any non-conductive substance successfully, the

"case-history" of the material must be known so that the surface may be prepared properly for metallizing. All plastic materials do not receive the same treatment. The differences mainly lie in the preparatory operations such as roughening and cleaning, or in the reducing agent used.

The majority of plastics can be bonded for plating (by bonding, is meant the application of the conductive, thin silver coat) by using an ammoniacal silver nitrate solution in conjunction with the cane-sugar reagent (Brashear Formula) or using formaldehyde or Rochelle salts as the reducing agent. The author obtained best results with the formaldehyde solution. Catalin, urea resins, celluloid, Polystyrene and methyl methacrylate resins must be given a wet-tumbling usually using pumice and water, or a light depolishing, while cellulose acetate must go through an additional priming operation before actual bonding operations are started. Rubber is first treated with benzol or acetone and casein plastics with 3 to 4 per cent hydroquinone.

The reducing agents used also depend on the original plastic material; phenol-formaldehyde plastics can be treated with hydroquinone, pyrocatechin and acetone for a few minutes, and then after thorough drying, placed in silver nitrate solution, heated to 176 deg. F. Acrylic plastics are bonded by reduction with cane-sugar, nitric acid, alcohol and water in the presence of silver nitrate solution. Casein plastics are handled by using hydroquinone or p-amino phenol for reduction. Urea or thio-urea formaldehyde resins utilize boiling hydroquinone for reduction. The cellulose acetates are best bonded using formaldehyde and silver nitrate.

### Bonding Short Cuts

Sometimes, however, by knowing the type of plastic used, short-cut methods for bonding can be utilized. For example, bakelite can be bonded by merely immersing the resin for one-half hr. in a mixture of silver oxide, ammonia and water.

Copper films, like silver, can be deposited on plastics. Just as in the case of silvering methods, films of copper are formed by reduction with formaldehyde or hydrazine. The chloride or sulfate solution of copper is usually used. Gold films can be formed from an aqueous solution of gold chloride by using invert sugar, alcohol, citric acid or formaldehyde. Lead films can be applied using lead acetate with thio-urea as the reducing agent. Nickel films are deposited

from nickel carbonyl decomposed at 302 deg. F.

A process for plating on a common plastic material such as cellulose acetate, may be described as follows:

The parts, small plastic pieces which must be economically handled in bulk, are first wet-tumbled using pumice and water or blasted with 220 grain aluminum oxide until the gloss is removed and a dull sandy finish appears on their surfaces. This operation (wet-tumbling) may take from one to five hr. depending on the shape of the pieces and the amount of injection or compression molding "flash." After thoroughly rinsing and drying, they are cleaned for a short period of time in a 2 to 3 per cent cold caustic solution. The parts are held in an ordinary acid-dip pot during this and the next operation. After a thorough rinsing, the parts are treated for a few minutes in a tin sensitizing solution (patented) and then thoroughly rinsed. The parts are then placed in a tilted rubber bonding barrel which has enough water in it to completely cover the pieces. This barrel has ribs on its inner wall to insure against mass rolling of the parts and revolves about 4 rev. per min. The proper amount of ammoniacal silver solution is added and then the correct quantity of the formaldehyde solution. This bonding treatment requires about one-half hour, depending upon the shape of the parts.

After a suitable silver coating is applied, the parts are rinsed thoroughly and allowed to dry. A hot-air oven is recommended if over-night drying is not possible. When the parts are dry they are placed into an acid copper plating barrel rotating about 6 rev. per min. Large pieces can be bonded in the same manner but on wires or racks, and plated in still tanks.

## Practical Aspects of Hard Chromium Plating

**H**ARD chromium plating was discussed from a practical standpoint by Dr. D. A. Cotton, Delco Remy Division, General Motors.

The three outstanding characteristics of chromium are its hardness, its low coefficient of friction and its resistance to abrasion or wear. The term "hard chromium" has, no doubt, come into common usage to distinguish it from "decorative" chromium based apparently on the belief that there was a difference in chromium. In the writer's opinion, the only es-



WALTER L. PINNER

Serves as First Vice-President.

The amount of acid copper deposited usually varies from 0.0013 to 0.010 in. in thickness, depending on the type of piece being plated. After plating, the parts are usually bright dipped and tumbled if in bulk, or hand-polished in the case of large pieces. The final plate can be any desired metal.

Some of the applications for deposits of metals on various non-conducting surfaces are:

1. Gas and liquid proofing containers.
2. Electrical fuses, contacts, high tension devices, condensers, etc.
3. Industrial cams, instruments, machine-parts, reflectors, rollers.
4. Mirrors and molds for electroforming and electrotyping.
5. Scores of novelty and costume jewelry pieces too numerous to mention.
6. Radio parts—loop antennae, cabinets, coils, dials, grilles and knobs.
7. Airplane parts—dashboard parts, escutcheon plates, etc.

essential difference between the two classes of chromium plating lies in the thickness of plate rather than in the hardness. The writer has maintained that the value of chromium plating must lie in its resistance to wear and abrasion and its low coefficient of friction rather than in its intrinsic hardness.

Hard chromium plating divides itself naturally into three general classes:

1. Plating on tools to secure longer life and better finish of parts.

2. Plating to increase life of cutting tools.
3. Plating for build-up.

In Class 1 are included molds for synthetic plastics and rubber, drawing, heading, coining and forming dies, spinning tools, etc. Whereas an unplated plastics mold would have to be removed and repolished from time to time with a consequent loss in production, a chromium plated mold runs practically indefinitely without removal. So, too, forming and drawing dies when plated with chromium, last much longer and produce parts free from gall marks and scratches, thus saving subsequent finishing operations before painting or plating.

In Class 2 are included drills, taps, reamers, broaches, milling cutters, files, etc. The low coefficient of friction and wear resistance of the chromium are the factors which produce longer life of the tools. It is not even necessary to have plate on the cutting edges of some tools, so long as the adjacent surfaces are covered. For instance, drills may be plated all over, especially in the flutes, then they may be ground several times without plating. Only when the plating next to the cutting edges becomes worn through to steel are they stripped and replated.

Under Class 3 are all kinds of gages; plug, ring, snap and other inspection tools that have worn undersize. Such parts should be at least 0.001 in. or 0.003 in. undersize at the beginning, plated oversize and then ground down to size. When they wear undersize, they still have fairly heavy plate on them and can be replated without stripping.

Another important phase of build-up work is in bringing undersized, mis-machined production parts, or worn out machine tool parts up to size again. In these days of scarcity of materials, it becomes more than ever necessary to salvage parts instead of scrapping them.

The author, in a previous paper, stated that savings on salvage work alone, using only a 50-gal. bath, were \$16,000 per year. Two years later, after increasing the plating capacity to two 150-gal. tanks, savings were \$300,000 annually.

### Salvage Through Plating

Accounts were kept over a period of one year to determine the cost of this salvage work and it was found that it varied monthly from a low of 5.8 per cent to a high of 10.3 per cent, averaging 8.4 per cent for the year, based on the cost price of the parts salvaged.

The plating baths are run at 135



deg. F. to 140 deg. F. with a chromic acid concentration of 40 to 45 oz. per gal. (300 to 340 grams per liter) and sulfates at 0.55 to 0.65 oz. per gal., a ratio of about 70 to 1. Current densities range from 200 to 4000 amp. per sq. ft. of plating surface producing plates varying from 0.00005 in. to 0.040 in. or 0.050 in. The bath can, if necessary, plate from 0.007 in. to 0.010 in. per hr. on a diameter. Therefore, plating a mere 0.020 in. or 0.030 in. requires only two to four hr., depending upon the current density used.

Ring gages, plastic molds and other inside surfaces are plated at about 800 amp. per sq. ft.; plug gages at from 700 to 1300 amp. per sq. ft.; shafts are built up from 1000 to 1800 amp. per sq. ft. and files plated at 1500 to 4000 amp. per sq. ft.

Typical plating cycles for plug gages are as follows:

*Gages which have not been plated previously*

1. Grind undersize about 0.002 in. or 0.003 in. on the diameter.
2. Apply stop-off lacquer to the portion to be left unplated.
3. Place work in the plating tank and allow it to come up to the bath temperature.
4. Apply reverse current of about 200 to 300 amp. per sq. ft. for from 15 or 20 sec. to 1 min., depending on the kind of steel.
5. Reverse polarity to normal and apply the desired maximum current density ranging from 750 to 1250 amp. per sq. ft.
6. Plate to 0.002 in. or 0.003 in. over the required finish size.
7. Remove plated parts, rinse and dry.
8. Grind to size.

*Gages that have been plated, but have worn undersize*

1. Apply stop-off lacquer.
2. Place work in bath to warm up.
3. Apply reverse current treatment, using a current density of only about 200 amp. per sq. ft.
4. Reverse polarity to normal and start plating at a density that will barely produce a plate (about 100 amp. per sq. ft.).
5. Increase current in two or three steps at intervals of a few minutes, until at the end of a half hour, a density of 300 amp. per sq. ft. is attained.
6. Maintain this density for another half hour.
7. Raise current to the desired density (750 to 1250 amp. per sq. ft.) and plate to the required thickness.
8. Remove parts, rinse and dry.
9. Grind to size.

Where it is desired to plate a load of mixed gages, plate them as though they all have chromium on them.

### Inside Anodes Used

Owing to the poor throwing power of chromium plating solutions, it is



Past President to the Society is  
GEORGE WAGNER.

necessary when plating in holes and deep cavities to use an anode in the part being plated in order to direct current to the inside surfaces. In the case of plain holes, only a simple rod anode is necessary; with complicated shapes such as a distributor cap mold,

an anode which conforms to the general contour of the finished part is made up. "Lattice work" inside anodes, fabricated from lead wires into skeleton-like replicas of the complicated castings to be made in the various plastic molding dies allow ample circulation of the plating solution inside the work and permit easy and rapid escape of the evolved hydrogen gas.

Grinding wheels for this type of work should be rather soft, free-cutting wheels with a fairly open bond such as, for instance, a Norton 5760-N5-BE.

So far as heat treatment of chromium plated parts is concerned, the author does not follow the practice of applying such a treatment subsequent to the plating operation. He believes that, if the tool or die when made, has been given the proper heat treatment and has had the residual hardening and grinding strains relieved, the part will suffer no ill effects from the application of the chromium plate.

To relieve possible hydrogen embrittlement (which the author thinks is unlikely) parts may be heated at 300 deg. to 400 deg. F. for one-half to three-quarters of an hour.

## Porous Chromium Plating

AN extended paper on "Porous Chromium Plating, its Principles, Procedures and Operating Practices," was read by T. G. Coyle, United Chromium, Inc., Waterbury, Conn. This paper was awarded the first prize for the best paper read at the convention.

Porous chromium plate may be produced in a number of ways. It involves generally three principal control factors: The chromium plate as deposited; the etching treatment, and the finishing of the plate. The plating requires close coordination and control of bath composition, temperature and current density. The etching may be done by any of several methods, including chemical and electrochemical treatments; and the etched effect can be produced by mechanical means. These can be applied to the plate itself or to the basis metal, or both. Several types of finishing are used, generally either polishing, lapping or honing. The amount of plate removed and the rate of removal affect the porosity and the results obtained. The technique used in carrying out the porous chromium plating operation is much the same as that used in regular hard chromium plating practice where plating

to size is required. The only special equipment needed is the hones and inspection devices. Porous chromium plate has many possible applications, and at present is used extensively on rolls, piston rings, diesel engine cylinder liners and aircraft cylinders.

There are two general methods of producing a porous chromium plate. The first method, the mechanical, refers to the use of tools, abrasives, or other engraving mediums to cut pits or patterns into the plate itself, or into the basis metal, to be reproduced in the chromium plate. The second method, chemical and electrochemical, involves a stripping action, or etch, on the basis metal or on the chromium deposit. In both methods, the chromium is normally given a finishing operation, such as honing or polishing, to smooth off the tops of the prominences which constitute the actual bearing surface.

Chromium, as deposited, is generally, though not always, under great stress and usually contains cracks of microscopic size. As produced, these cracks are in haphazard arrangement and vary as to number, size and depth. Open cracks are often found in the surface of the plate; but there also are sealed-over cracks below the sur-

face. From almost the very initiation of deposition a stress is created in the deposit. As the plate builds up in thickness, it appears this stress increases until it reaches the ultimate strength of the chromium deposit, which then fractures, relieving the stress and leaving fine cracks. These very fine cracks heal over as the plating continues, and the stress builds up again to the breaking point and new cracks form, which in turn heal over. This goes on throughout the whole plating time, with the outer surface frequently showing open cracks, and covering over at varying depths below the surface, the healed-over cracks. The open cracks and secondary, tertiary, etc., healed-over cracks all play a part in porosity formation and control.

The significance of these cracks lies in the fact that when present, they constitute nuclei for formation, by chemical or electrochemical etching, of the fissures in the plate. Furthermore, the frequency or spacing of the cracks (that is, the size of the crack pattern) largely determines the type and degree of porosity.

#### Porosity Through Etching

The second factor in producing the porosity is the etching of the chromium deposit. The dissolving of the chromium plate, when subjected to a chemical etching treatment (except with masking) proceeds faster at the cracks in the plate than on the areas (plateaus) bounded by the cracks. There is thus etched into the surface of the plate a multitude of fissures or channels with a deepening and widening of the original cracks, to create a surface structure made up of tiny plateaus of chromium, surrounded by still tinier canals, resembling a pattern of dried mudcracks, or alligator skin. As the etching proceeds, the fissures get deeper and also wider, eating away at the edges of the plateaus, which get smaller and, under the microscope, take on the appearance of a piece of shattered glass. The plateaus, however, dissolve from the top also, and after a time an equilibrium is reached between the rate of dissolving in the cracks or fissures and from the plateau surfaces, so that there is relatively little, if any, further increase in the depth of the fissures or pores. Beyond this point, the plate just continues to dissolve without any great increase in depth of channels.

In using the designation "mechanical" to classify a general method of porous chromium plating, the author has in mind, those methods where the



**JACK BAIN,**  
the Electroplaters' business manager.

porosity is produced mechanically by cutting, blasting, engraving or other means, either on the plate or on the basis metal before plating. If the porosity is cut or engraved into the plate, there it is; if the basis metal is roughened or pitted, there is the basis for porosity development in the plate as it is deposited, and the controlled roughness is reproduced.

Combinations or modifications of mechanical and chemical methods may be employed. One could use a chemical etching of the basis metal instead of a mechanical grit-blasting; or a masking of the plate to obtain a pat-



**ELLSWORTH T. CANDIE,**  
Executive Secretary of the Society.

tern by chemical or electrochemical etching.

In both the mechanical and chemical methods of porosity development, the third major factor in fixing the degree of porosity is the final mechanical finishing operation (the honing, lapping, polishing, etc.). Here, primarily, the extent to which the etched or porous layer is cut away, determines the degree of porosity which results. There are also some secondary factors that are important, such as the rate and severity of cutting, the surface finish produced on the plateaus, and the cleaning of the pits or channels of abrasive particles left from the cutting operation. These particles consist of chromium and cutting stone material and are often referred to as "honing debris."

A fine finish on the plateaus is of great importance in many applications, because these plateaus constitute the actual contact surface. Even where the type and degree of porosity are entirely acceptable, too coarse a finish on the plateaus may cause too rapid a wear of the piston rings riding on these plateaus. Here, also, the choice of abrasives and the skill and technique in the finishing operation control the results.

With the honing or polishing completed, there still remains what, in some applications, is a very important operation in the finishing treatment. It is the cleaning of "honing debris" out of the pores or channels of the plate. While most of this abrasive debris is carried away with the cutting and coolant oil used in honing, some of it remains in the pores.

The principles of rack design for doing a porous chromium job are the same as for a regular hard plate job where "plating to size" to the same tolerances is required. Since only a small thickness of plate can be removed in the final finishing operations without too much of an effect on the degree of porosity, it is evident that the deposit on a cylinder wall, for example, before honing must be uniformly distributed within very close tolerances. This requirement is met by use of the usual devices familiar to the hard chromium plater for controlling current distribution, such as conforming anodes, shields, guards, extension collars, insulators, stop-offs and the like.

#### Bath Composition

The plating bath is the Fink bath, using chromic acid plus catalyst acid radicals, such as  $\text{SO}_4$ . No other additions are needed. Variations in the

(Continued on Page 152)





**P**RESIDENT for the coming year, P. H. Bates of the National Bureau of Standards brings to his new post years of active service in the interests of the society.

## Record Group Attends ASTM Conference



**A**RTHUR W. CARPENTER, manager of B. F. Goodrich Co.'s Testing Laboratories will serve the society as its vice-president for the next two years.

**S**ETTING an all-time record for the society, more than 2050 persons attended the 47th annual meeting of the American Society of Testing Materials and spent a busy week in New York where from June 26 to 30, they attended committee meetings, heard 100 technical papers and listened to guest lecturers.

Much work was telescoped into this streamlined meeting as committees worked on the 1945 Book of Standards, the publication date of which was advanced one year to appear late in 1944.

At the Wednesday evening session, the new officers were presented to the society's attending members. President for a term of one year is P. H. Bates, chief of the Clay and Silicate Products Division of the National Bureau of Standards. Mr. Bates has been chairman of the ASTM Committee C-1 on Cement since 1926 and in 1940 he was the Edgar Marburg Lecturer on the subject "Portland Cement—Theories (Proved and Otherwise) and Specifications." He was a member of the executive committee from 1937 to 1939 and is completing a term as vice-president.

Arthur W. Carpenter, manager, Testing Laboratories, B. F. Goodrich Co., Akron, Ohio, will be the Society's vice-president for the next two years. Members of the executive committee who are elected for a term of two years are: W. C. Hanna, chief chemist and chemical engineer, California Portland Cement Co., Colton, Cal.; L. B. Jones, engineer of tests in the Test Department of the Pennsylvania Railroad Co., Altoona, Pa.; J. T. Mac-

Kenzie, chief metallurgist, American Cast Iron Pipe Co., Birmingham; J. G. Morrow, chief metallurgist, Steel Co. of Canada, Ltd., Hamilton, Ontario, and Sam Tour, president of Sam Tour & Co., Inc., New York.

Also at this Wednesday session, honorary memberships were awarded to Rudolph P. Miller, Milton E. McDonnell and Herman Von Schrenk for their outstanding leadership in the work of the society.

This year's Edgar Marburg Lecture was presented by Dr. Harold DeWitt Smith who discussed "Textile Fibers

—An Engineering Approach." Since in a mechanical sense textile fibers should be considered as tiny beams, Dr. Smith offered a study of their mechanical properties, such as strength, stiffness, resilience, elasticity, and surface friction in relation to the properties desired in textile yarns and fabrics.

Dr. C. K. Leith speaking on "Minerals and World Peace" was the guest lecturer at the general session. In his talk Dr. Leith developed the growing interdependence of nations for mineral products brought about by expanding industrialization and the resulting rivalry of nations for mineral supplies. To meet new conditions and minimize the threat to world peace due to this situation, Dr. Leith suggested an over-all United States mineral policy both domestic and foreign.

The technical program included a round table discussion of centrifugal castings. Leading producers and those concerned with their use discussed various factors involved in the determination of quality. Type of test specimens, how best they can be obtained, whether they are truly representative of the particular series were some of the subjects considered. A. E. Schuh of the United States Pipe & Foundry Co. and J. T. MacKenzie of American Cast Iron Pipe Co. served on the informal committee.

Other sessions were devoted to progress reports by the various committee recommendations for revisions in standard specifications and descriptions of new investigations and tests.



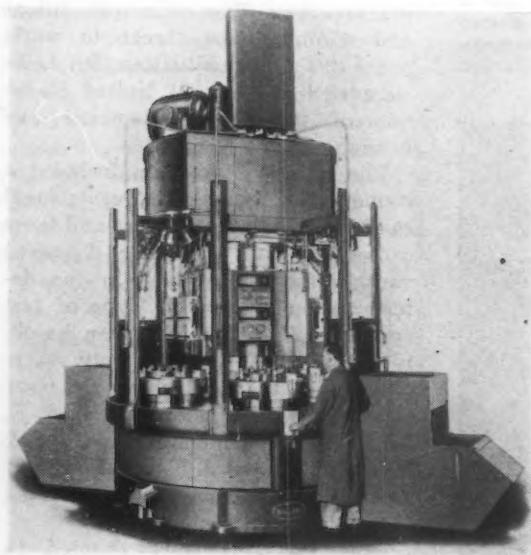
**S**AM TOUR, president of Sam Tour & Co., is a member of the newly elected executive committee. His co-members are: W. C. Hanna, L. B. Jones and J. T. MacKenzie.

# New Equipment . . .

## Machine Tools

. . . Recent developments in grinding, boring, facing and threading machines are described in the following pages.

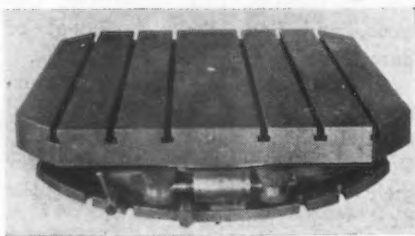
**T**HE first machine of its size to be a planned production unit for machining work up to 34 in. in diameter and up to 23 in. in height has been built by the *Bullard Co.*, Bridgeport 2, Conn. In this new size Mult-Au-Matic six heads are provided—two at each of three working stations, each with independent feed works and each providing vertical, horizontal or angular motion. A specially designed indexing and locking mechanism gives smooth indexing and provides rigid positioning and locking of the carrier at the completion of the index. Hydraulic feed "kick-out" in each feed train prevents carbide tool breakage when the machine is stopped in uncompleted cuts. An adjustable column carrying the tool heads permits moving up and down of all six heads as a unit. A dual speed range gives low speed with more power for slow, heavy cuts, or high speed for the smaller diameters. This is so designed that one or two spindles may be in low speed while the others are in high range or vice-versa.



Rotary Table

**A** ROTARY table to be used in connection with its horizontal boring, drilling and milling machine

has been built by *Portage Machine Co.*, Akron, in sizes 36 x 36 and 48 x 48 in. Graduations are in  $\frac{1}{2}$  deg. and fixed bushings at 90, 60, 45 and 30-deg. points are provided. The table pivots on roller bearings and is cast in Meehanite to assure rigidity and maintained dimensional accuracy. Hardened keys in the base of the table permit easy alignment on the boring mill table. As an accessory

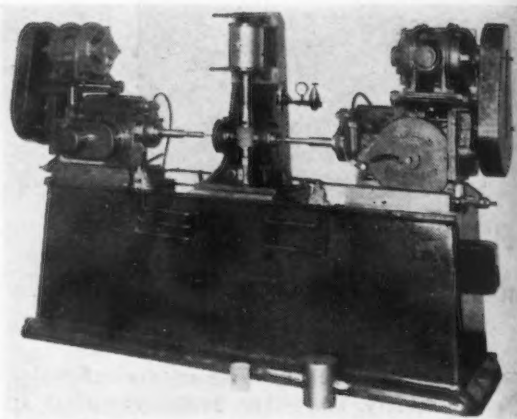


the table allows a number of operations with a single clamping, eliminating the necessity of making numerous setups.

### Piston Drilling Machine

**T**HE piston drilling machine built by *W. K. Millholland Machinery Co.*, 1048 Fairfield Avenue, Indianapolis 5, was designed primarily for drilling piston pin holes in job lots of pistons for replacement manufacturing where various sizes of pistons are put through in relatively small lots. The machine illustrated will take pistons from 2 $\frac{3}{4}$  to 6-in. diameter. It is a double end machine having two No. 4 automatic cam-operated drilling units mounted opposed on

a welded steel bed. Speed changes are made by changing the sheave pulleys on the V-belt drive. Splined pick off gears provide the feed changes. Plate



cams are provided for various increments of travel for different lengths of piston bosses.

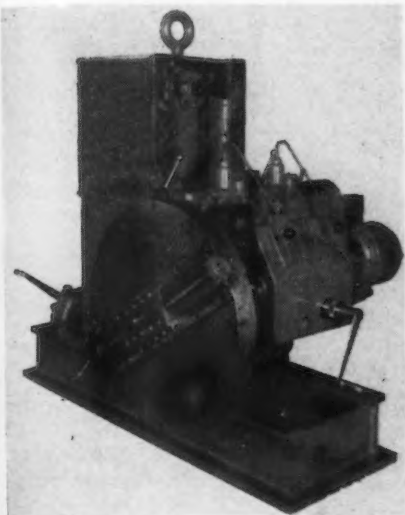
### Carriage Mounted Drills

**A** NEW line of high speed carriage drills for production drilling of aluminum alloy spars, wing panels, and other long assemblies are now being produced by *Farnham Mfg. Co.*, Buffalo. The addition of rails is all that is necessary to make an existing assembly fixture suitable for machine drilling. A variety of carriage mountings for assembly fixtures is available (horizontal mounting illustrated). For curved surfaces, such as wing panels, a carriage unit is available which is automatically controlled by a cam, keeping drill perpendicular to contour of work as carriage travels on straight track. After the drill unit is manually located in jig hole, and thumb button depressed, drill feed to depth and return stroke are entirely automatic.

### Boring and Facing Machine

**T**HE *General Engineering & Mfg. Co.*, 1523 South 10th Street, St. Louis 4, has developed a special boring and facing machine for use where the workpieces are very large and heavy and the surfaces on some cannot be machined on standard machine tools. This Gemco machine may be moved to the workpieces, placed in proper position, and the required surfaces faced and bored. When used as a

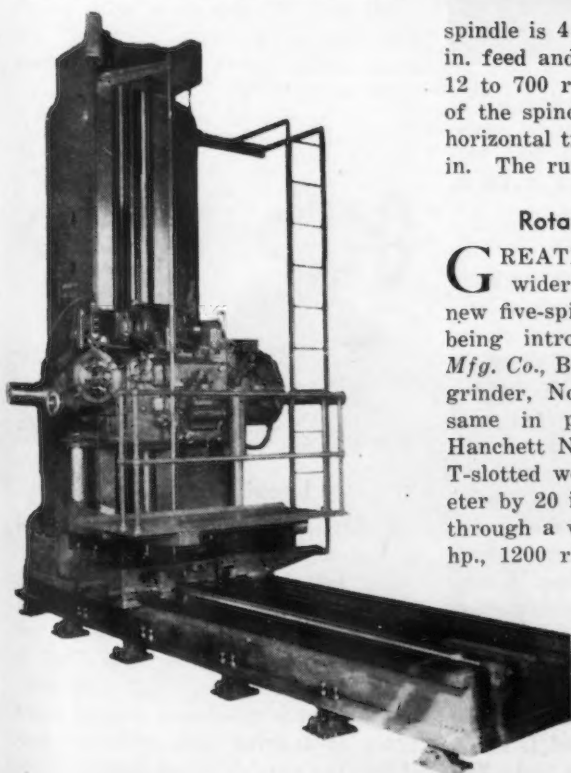




stationary machine the workpiece may be anchored to the base plate. A 5-hp. motor supplies ample power for all boring and facing operations, and seven different speeds ranging from 7 to 100 r.p.m. may be imparted to the main spindle and faceplate through a combination of transmission units. A feed selector handwheel permits horizontal movement of the spindle housing in four steps ranging from 0.009 to 0.063 in. per spindle revolution. Horizontal movement of the spindle housing may be accomplished by either a hand crank or by automatic means.

#### Drilling and Boring Machine

**A** MACHINE for heavy duty drilling and boring operations requiring



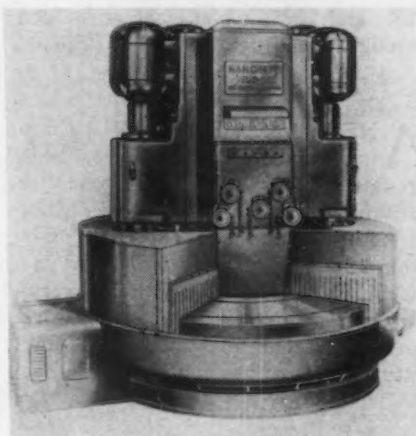
ing a quill type spindle has been developed by Cincinnati Gilbert Machine Co., Cincinnati 23. This type of spindle is valuable when multiple drill heads are required since they can be fastened to the spindle quill and be driven by the spindle. The spindle driving mechanism and the feed change mechanism is the same as used in this company's horizontal boring, drilling and milling machines. The quick hand adjustment and spindle feed friction clutch is the same as used on its 19 in. column radial drills. The self-contained unit head can be mounted on certain existing floor type column such as Pawling & Harnischfeger or Ryerson's No. 11 and No. 12 horizontal drill. The head is a self-contained unit fully enclosed, with built-in reversible drive motor and the lubricating system. The quill type



spindle is 4 in. in diameter, has a 36 in. feed and 24 speeds, ranging from 12 to 700 r.p.m. The vertical travel of the spindle head is 84 in. and the horizontal travel of the column is 120 in. The runaway is 45 in. wide.

#### Rotary Surface Grinder

**G**REATER grinding capacity and wider utility are afforded by a new five-spindle surface grinder now being introduced by the Hanchett Mfg. Co., Big Rapids, Mich. This new grinder, No. 100, is larger, but the same in principle as the present Hanchett No. 72. The No. 100 has a T-slotted work table 100 in. in diameter by 20 in. in width, and is driven through a variable speed unit by a 5 hp., 1200 r.p.m. motor. Each of its five grinding wheel heads has a 40 hp., 900 r.p.m. motor, making a total of 200 hp. for grinding wheels. Each grinding wheel head is fitted with an automatic sizing device,



which automatically compensates for wheel wear and operates in increments of 0.0002 in. The first three grinding wheels, the stock removing wheels, are usually coarse grained, the fourth wheel medium fine grain, and the fifth wheel, or finishing wheel, of a rather fine grain. Variations in the grain numbers can be made to fit the job.

#### Internal Grinder

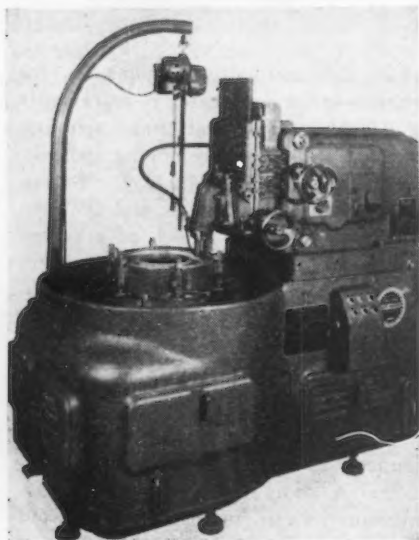
**A**N internal grinder utilizing a combination of hydraulic operation and electric control has been announced by Sav-Way Industries, Detroit. A short table stroke, 5/32 in. minimum, rapid table feed and rapid reverse are outstanding features of the Sav-Way "Spitfire." Solenoid operated valves and aircraft type micro-limit switches provide constant control and reduce time lag. The machine is also equipped for hand table feed. The grinder is available with either manual or electrically controlled power cross feed. The electric cross feed gives a cross slide ratchet feed of 0.0001 in. per tooth, resulting in 0.0002 in. increase in the diameter of the hole. The cross slide handwheel is graduated in increments of 0.000125 in. The spindle is driven by a 3 hp., 3600 r.p.m. motor, and the workhead spindle by a 1/2 hp., 1140 r.p.m. motor. Workhead spindle speeds of 90, 145,



235, and 365 r.p.m. are provided through an adjustable V-belt drive.

### Gear Tooth Shaver

A NEW precision gear tooth shaving machine has just been brought out by *National Broach & Machine Co.*, Detroit, for the finishing of both internal and external gears from 12 to 36 in. pitch diameter. The machine consists essentially of a rotary work table on which the work gear is carried in a quick clamping fixture and a horizontal feed slide



which carries on its forward end the cutter head with its vertical cross feed slide. The function of the horizontal slide is to feed the cutter into the work while that of the vertical slide is to reciprocate the cutter across the face of the work. As cutter and work rotate, the cutter head moves slowly downward at a selected rate of between 0.004 and 0.016 in. per work gear revolution. A single power unit drives both work table and vertical cross feed slide. The speed of both may be varied over a wide range by means of change gears. An automatic counter stops the machine at the termination of any predetermined number of strokes of the cutter head. Provision has been made to compensate for heat treat distortion causing a taper-tooth condition, so common to gears of off-center web construction. This is done by setting an appropriately graduated dial to the prescribed amount for producing a converse condition in the work. A 500-lb. capacity electric hoist mounted on a swinging jib crane is optional equipment.

### Thread Grinder

AN electronically controlled thread grinder has been developed by the *Dalzen Tool & Mfg. Co.*, 12255

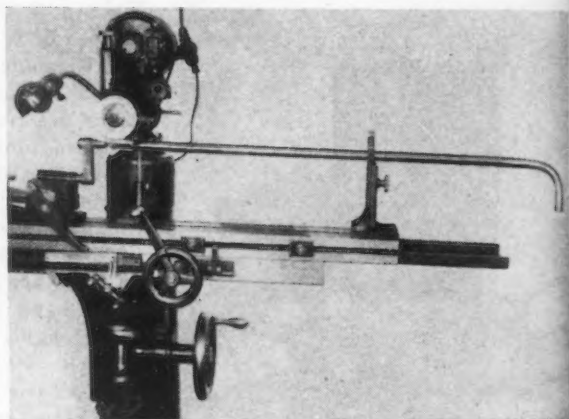
East Eight Mile Road, Detroit 5. Speeds of work and grinding wheel are individually controlled by dial settings of the G. E. Thy-motrol drive. Variation is stepless and the ratio of speeds infinite in both forward and reverse. Two types of automatic wheel dressing attachments are offered. The No. 5 universal machine handles a wide variety of work up to 9 $\frac{3}{4}$ -in. length of thread any place on a 20-in. shaft. Cutter relief may be ground up to 0.025 in. per  $\frac{1}{8}$ -in. length of land. Cutters with as



many as 24 flutes may be relieved. The No. 6 production model without back-off feature handles work up to a full 20-in. length of thread on a 20-in. shaft.

### Tap Grinder

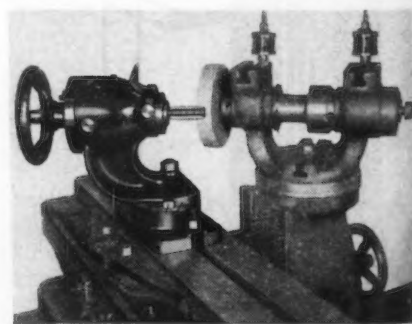
A TAP grinder from which it is possible to get as many as ten grinds, each of which has true circular relief and which, it is claimed, is equal to or better than the factory grind, is announced by *Cleveland Tool Engineering Co.*, 1236 West 4th Street, Cleveland 13. This circular relief grinder is equipped with special attachments to accommodate any size ship or boiler reamer or tap, including all bent shank type taps. A constant height V-block in conjunction with an offset center, enables the less experienced operator to speedily center a tap of any diameter. By setting the graduated adjustable cam to the correct position, equal relief is given to each cutting edge of the tool. The



exact outside contour of the tap or reamer can be followed automatically.

### Chamfer Grinding Head

A GRINDING head designed for sharpening chamfers of taps and other tapered tools having evenly spaced flutes has been developed by *Henry P. Boggis & Co.*, 1279 West Third Street, Cleveland 13. Eccentric relief is ground on chamfers and all lands of the tool are ground equally in each rotation by a repetition of a cam action over each land. A special feature of these heads is the use of collets to hold tools, thus allowing repeated grinding even after the forward center may have been destroyed. Both chamfer and flute grinding heads are arranged to sharpen tools with three different numbers of flutes. Both heads are available in three sizes: "A" for tools with shank diameters to 0.500 in., "B" for tools with shank diameters to 0.800 in., and "C" for tools with shank diameters from 0.500 to 1.250 in.



### Lapping Machine

A LIGHT and heavy duty vertical straight lapping machine with short and long strokes for lapping bearings, drill jig bushings and small diameters from 0.050 to 0.375 in. has been developed by the *Roos Tool & Mfg. Co.*, Montclair, N. J. The company also has developed several other types of lapping and polishing machines for wire drawing dies.





Giant rubber-pad Airplane press uses Oilgear Fluid Power for all motions. Tables travel up to 3 feet per second yet accelerate and decelerate without jar. All functions together with selective sequence obtained simply with standard equipment. Tables can be brought under press as loaded. No waiting, no delay. Proved dependable trouble-free performance.



## AND STEP UP PRODUCTION

**Oilgear helps designers to get full press production capacity**

Plane part plant after plane part plant is converting to these new Oilgear-powered 2½-, 3-, and 5-thousand-ton presses... selective or sequence loading and feeding on the 4-way shuttle tables are cutting down press non-productive time and boosting output tremendously. Oilgear's role is to provide the flexible, controllable power that makes such operations possible.

Sheet metal to be formed and dies are set up on table unsecured, the table accelerates smoothly so as not to disturb the set-up, travels as high as 3 feet per second, decelerates without jar under the rubber-pad press, and, after the forming operation, withdraws, its place taken by another loaded table. All operations are controlled automatically and remotely. Yet sequence can be varied at will to let tables feed under the press as fast as they are loaded, and all functions are obtained with simple, standard Oilgear equipment.

Flexible, versatile, adaptable Oilgear Fluid Power offers many other advantages too, all of them applicable to giant and midget machines alike. Forward-looking builders and users of machines and processes cannot afford to overlook these advantages. Find out from Oilgear engineers what Oilgear can do for you. Write today... **THE OILGEAR COMPANY, 1303 West Bruce Street, Milwaukee 4, Wisconsin.**



### ARE YOU TRYING TO:

1. Apply large forces through long... or short... strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction... with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light... or heavy... forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

*You Need Oilgear!*

# OILGEAR

## Fluid Power

# Assembly Line . . . STANLEY H. BRAMS

• WPB authorization to build pilot models and to order tools, plus time before output can begin, make a real likelihood of brand new postwar cars, not face-lifted 1942's.



**D**ETROIT—In chemistry the combining of common elements can produce an uncommon result. In automobiles, the combining of new reconversion factors can produce an equally startling outcome.

Grounds exist in Detroit today for speculation of the most fascinating sort, based on three phases of the current scene. Here are the three:

1—The automobile companies, like others, are now permitted to build experimental models. 2—The automobile companies, like others, can order tooling for their reconversion, so long as deliveries do not impair war production. 3—The manufacture of civilian cars is indefinitely in the future, undoubtedly six months at minimum, quite likely more.

Add those conditions together and suddenly, full blown, there arises the likelihood that the first reconversion cars will be really brand new cars, not face-lifted versions of the 1942 models.

It must be borne in mind that there were always a few basic concerns in the minds of the motor car men during the past year or two when they talked about postwar cars. One was that a huge pentup demand existed, and that dealers would so urgently want the earliest possible deliveries that if their own factories could not provide them, they might shift franchises and get stock elsewhere. Corollary to that condition was the fact that the quickest way to resume production would be to pick up where

1942 output left off, by getting the old dies and tools and machines back into line.

Until recently the thesis was sound as a dollar and was undeniably true. But when authority exists to experiment, as it does, and when time and authority exist to retool, as they do, the thesis becomes as sour as last month's milk, and just about as usable.

Detroit, then, may have silently turned a corner in its thinking during June. There are some evidences of a positive turn.

One company is said to be moving along on an interesting body program intended to produce an end product which will be orthodox, but which cannot be regarded in any sense as a minor change. One other company is said to be talking to a few members of its inner circle of suppliers about a car of somewhat lower horsepower and smaller size than its prewar offerings.

One company is said to have a small interior section of its plant boarded off, wherein new car developmental work is being started in an atmosphere whose very ventilators

pledged themselves to continue to exert cupants.

Now all these developments, and probably others like them, may not be for the first postwar automobiles to be authorized. But it is safer than wagering on the presidential race to bet that if these experimental programs result in sound products, they will be the first postwar cars. There is no other way to look at it. The highly competitive automobile industry plants will not hold back on their new ideas when a sales killing is ready to be made.

**T**HE stage is slowly taking shape for a development of that kind. To review, the first step in a new car's production is the research and experimental work. This is obviously in hand. Then may come the summoning of the engineering companies to map layout and production; then comes the tooling; then comes production. The engineering companies are beginning to taper off their activities, and there are enough of them around Detroit to provide facilities for their phase of the job in a little while. Subsequent tooling, from today's looks of things, will not be

**CAPTURED AIRPORT:** Here is what remains of the captured Littoria Airport near Rome. The photo shows the interior of a blasted machine-shop hangar. Allied airmen made Littoria a target early in their successful offensive against Rome.





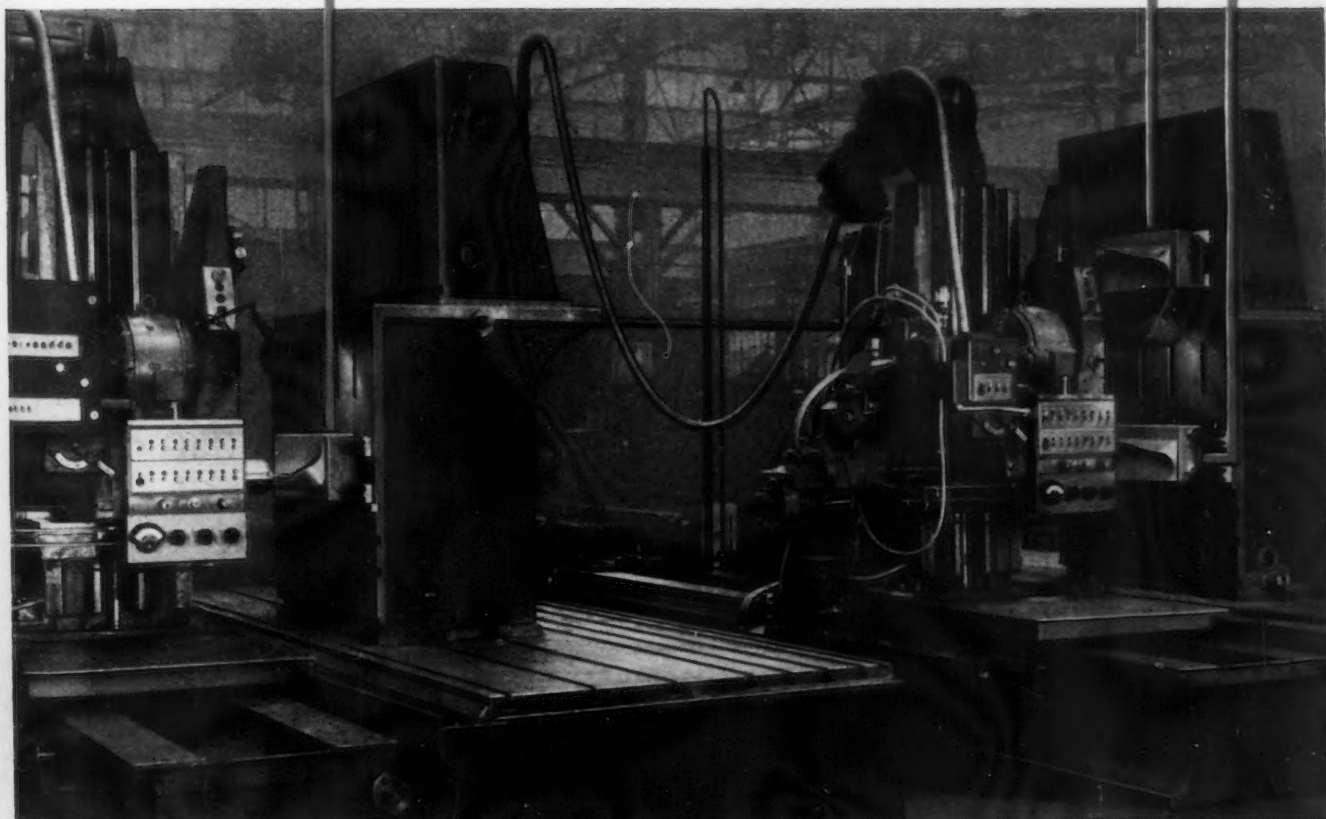
# LEFT AND RIGHT from a single master

Here's a war-inspired Keller improvement of far-reaching significance for further war production and, soon we hope, for faster peacetime tooling.

With synchronous control reversal as illustrated, two Kellers can now produce left- and right-hand dies of perfect symmetry in a single operation. As the right-hand "sending" machine cuts a right-hand die guided by the master (see upper right corner of photograph), it sends an identical but reversed pattern to the left-hand "receiving" Keller machine.

Result — two dies from a single master together with symmetry impossible to achieve with separate handmade left- and right-hand masters as formerly required. Interpretation — faster tooling for all automotive and other parts, such as fenders, doors and side panels, that require symmetrical right- and left-hand parts — plus worth-while cost reduction.

Complete information regarding synchronous control reversal for right to left reproduction for P&W Keller machines is available upon request.



## PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

too greatly delayed. There will finally remain only the go ahead from Washington on a resumption of output, and that has been promised when Germany falls.

Pontiac has revealed the outlines of its postwar production planning, based on the expenditure of about \$35,000,000 for enlarged plant and equipment. Foundry capacity will be increased, as will motor plant and axle capacity. A new salvage department building will be erected, and the present torpedo plant will be converted into a huge parts building.

Harry J. Klingler, general manager, stated that Pontiac plans to build 500,000 cars during the first year of unrestricted production. In 1941 this General Motors division produced around 350,000 assemblies, which, according to Klingler, fell some 50,000 units short of possible sales.

In this reconversion planning, there is plenty of thinking being given to the dealer side of the picture. The inevitable beating of the back-country bushes by field men has begun. The orators of the sales departments have started their chataqua-like road trips out to the district or zone sales meetings, to stir the pulses of the dealers with their breath-taking pictures of products, business and profits ahead. Some outlets have started up dealer council programs again, summoning agency committees to Detroit to confer, to make suggestions, and to go back home imbued with the evangelical new model year zeal which is so peculiarly automotive.

General Motors has written another chapter in its long term program of improving dealer relations by announcing a new contract for all its dealers, to extend for two years from the time new car production is resumed.

Termination of the contract without specifying a cause, a provision which existed in prewar contracts, is eliminated in the new agreement. The company can withdraw the franchise, because of unsatisfactory performance by the dealer, or for other generally specified reasons — death, bankruptcy, etc.

No later than three months before the expiration of these contracts, the five General Motors passenger car divisions will offer new selling agreements to their dealers. Company sales executives declare that their objective is and will be to maintain mutually satisfactory and continuous dealer relationships with a minimum of changes or substitutions.

Non-civilian bits of news continue

to interlard the reconversion thinking. Two interesting military production developments came to light late in June in Detroit.

**T**HE Ford Willow Run bomber plant completed its 5000th Liberator bomber on June 29. Output is now at a rate of one bomber an hour, said company sources. Of the aggregate to date, more than 4000 units have been built in the past 12 months.

Approximately 1800 units were shipped out of the Willow Run plant

in knockdown sections for assembly elsewhere. The remaining 3200 were flown away from the suburban Detroit plant. It was last November when the flyaway of 1000 units was announced; flyaways since then have averaged about 300 per month.

At Dodge, meanwhile, announcement was made that the plant is in production on rocket shell forgings. These forgings then go to the Chrysler division, where other parts are produced and the entire rocket shell assembled.

## Machine Tool Pricing Revised

• • • Pricing provisions covering sales of new machine tools, attachments and parts have been revised and broadened and issued in the form of a new OPA price regulation. The new regulation (MPR 67, effective June 28) will not change the present level of prices for the articles covered, but is designed to simplify the pricing of these machines and parts.

Instead of freezing list prices in effect on Oct. 1, 1941, the regulation now freezes all prices in effect on that date, since many manufacturers do not operate on a list price basis. In the case of new machine tools, attachment or parts which the manufacturer intends to distribute through dealers for the first time, a provision has been added which permits the addition of resale discount or commission to the price in effect on Oct. 1, 1941, or the last contract price during the period Jan. 1 to Oct. 1, 1941.

Provision has also been made for

the pricing of new machine tools, attachments and parts which represent more than a modification of an article for which a maximum price is established. Maximum prices for these types of machine tools, attachments and parts are determined by the use of the pricing formula the manufacturer had in effect on Oct. 1, 1941. The price for the second order and all subsequent orders is determined by recomputing the maximum price and deducting all nonrecurring costs reflected in the price for the first order.

To facilitate price control, leases and rentals of new machine tools, previously covered by MPR 136, are now covered by the new regulation. Maximum rental rates have been established on the basis of stated percentages of the maximum price of the new machine tool. This method is the same as that employed by MPR 1 in determining rental rates for second-hand machine tools.

## Alex D. Bailey Nominated For A.S.M.E. Presidency

• • • Alex D. Bailey, vice-president of the Commonwealth Edison Co., Chicago, has been nominated as president of the American Society of Mechanical Engineers. Nominations for vice-president are: David Larkin, vice-president and general manager of the Broderick & Bascom Rope Co., St. Louis; John E. Lovely, vice-president, Jones & Lamson Machine Co., Springfield, Vt., and Thomas S. McEwan, vice-president, McClure, Haddon and Ortman, Inc., St. Louis.

Nominated as managers are: Daniel S. Ellis, vice-president in charge of manufacturing, Lima Locomotive Works, Inc., Lima, Ohio; Arthur J. Kerr, district manager of sales, Pittsburgh Equitable Meter Co., Tulsa,

Okla., and Herman George Thielscher, mechanical engineer, Potomac Electric Power Co., Washington.

## Bethlehem's Atlas Barrel Plant Acquired by Rheem

• • • Rheem Mfg. Co. on July 1 announced the acquisition of the Atlas Steel Barrel Division of Bethlehem Steel Co., Bayonne, New Jersey. This acquisition gives Rheem a factory in every important steel container market and brings the total of Rheem plants to 14, located in nine states from the Atlantic to the Pacific and from the Great Lakes to the Gulf.

Robert Campbell, president of Atlas Steel Barrel Corp., before its acquisition by Bethlehem and since then manager of the plant, will become a vice-president of the Rheem company.



# How Matched Tool Steels

Reduce "downtime" and cut unit costs . . .

**TOOL:** Special Punch

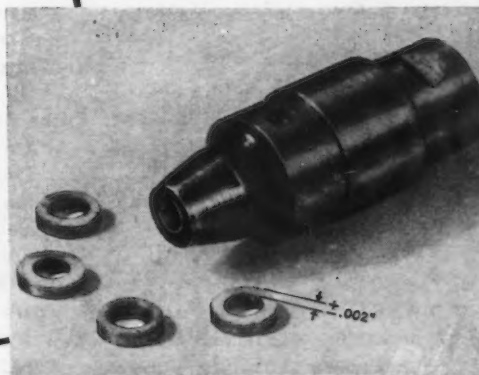
**OPERATION:** Punching small washer

## THE PROBLEM:

Stepping up production of a washer punched from an abrasive rubberized asbestos sheet -- still maintaining close dimensional tolerances. Shutdown for regrinding necessary after only 17,000 pieces.

## THE MATCHED SET SOLUTION:

By use of Carpenter Hampden (Oil-Wear) in place of a high carbon water-hardening tool steel, production time between regrinds tripled; production increased from 17,000 pieces to over 60,000 pieces per grind. Three hours tool regrind time saved daily.



● Whenever a machine or press must be stopped—output stops—and unit costs go up. The more "downtime" the higher those unit costs go.

Excessive "downtime" is often directly traceable to tools that require too frequent maintenance attention—regrinding, repairing or replacement. The example cited above indicates the benefits when "downtime" is reduced.

Many a man responsible for tools has made the discovery that much tool-caused "downtime" is unnecessary and can be eliminated—with the help of Carpenter Matched Tool Steels.

1. Because these 9 Tool Steels simplify selection—and help you get the right tool steel for maximum service on each job.
2. Because complete and easy to use heat treating instructions are furnished for each steel to safeguard hardening results and step up tool performance.

These advantages make Carpenter Matched Tool Steels easier to use in the tool rooms—and assure tools and dies that stay on the job—work more

consecutive hours with less maintenance. The result is higher machine output and lower unit costs.



Carpenter Matched Tool Steels are available from conveniently located warehouse stocks. A 168-page manual provides a handy, convenient way to find the right steel for each job and supplies full and complete information on analysis, physicals, working properties and heat treatment. This manual is available from your Carpenter representative. Ask him for a copy—or write us on your company letterhead, giving position or title, please.

The Carpenter Steel Co., 121 W. Bern St., Reading, Pa.

**Carpenter**  
**MATCHED**  
**TOOL STEELS**



• **Analysis of CIO-USWA demands narrows speculation as to outcome of WLB panel decision . . . Guaranteed annual wage seems beyond scope of authority . . .**



WASHINGTON—Now that the demands of the CIO-USWA have been carefully analyzed by the steel industry before the WLB panel, speculation regarding the nature of the decision has been narrowed by the process of eliminating those whose granting seems improbable. They at least seem improbable to the industry both because of lack of jurisdiction or the nature of the demands such as those that could not be made effective even under government order. The guaranteed annual wage is an example of such demands. Aside from contending that the WLB—being a wartime body—has no authority to grant such a demand the industry has made it clear that it could not be applied even if ordered.

There are many reasons why this is so. The cost would bankrupt the industry. For another thing the steel industry would have to guarantee regularized demand for standard steel products before it could guarantee an annual wage. This can't be of course. Steel has thousands of specifications. It has many thousands of customers whose requirements are irregular and often uncertain just as their own operations are irregular and uncertain. Steel products cannot be stockpiled, even if there was room for these heavy space-taking tonnages. It is not like standard grades of groceries or textiles that not only take less room in warehouses but are in regular though varying demand.

ON the side of authority the board is faced with the guaranteed annual wage and other demands

which clearly are beyond its jurisdiction. But whether this will bother a majority of the board remains to be seen. Its past performance would indicate that it might lightly brush aside such an obstacle and proceed to promulgate an order cut to its own predilection. Or, if it is hesitant over making findings of its own for fear of shattering to pieces the stabilization program or for other reasons it might follow a pattern that has become common and go to the White House for advice. It has done so in the past and indeed did so in the present case, as a result of which it reversed its own action.

This was the outgrowth of the union demand for retroactive pay if wage increases were granted. The majority of the board—public and industry members—last December voted against retroactivity. They said that to grant it would imply assurance of a wage increase. The union naturally worked itself into a lather over this ruling, and burst forth into hot rhetorical outbursts, fully aware that its bark generally is as effective as a bite. CIO-USWA President Philip Murray said the ruling was "provocative" as it would be for the union since any sort of turndown given it is provocative. To reinforce its blasts

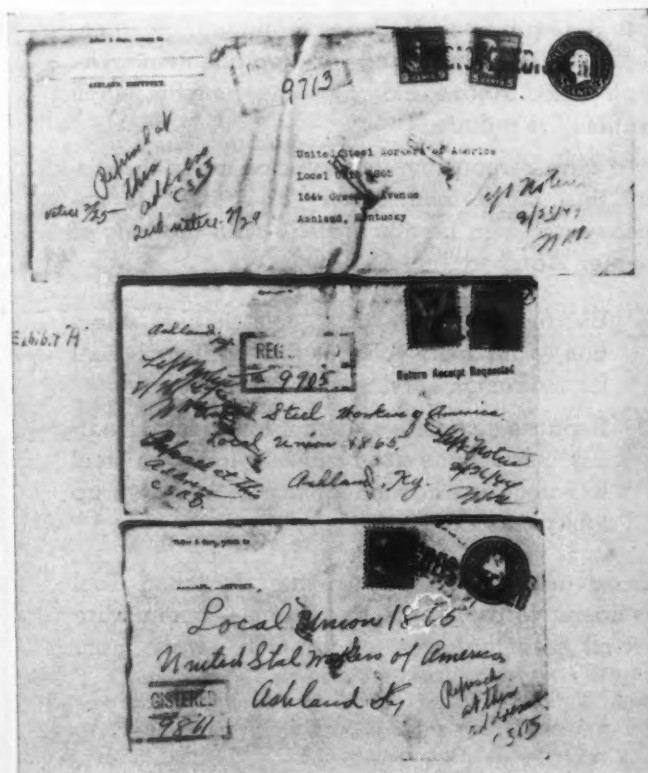
against the ruling, the union, again following a routine technique, completely disregarded its no-strike pledge and threatened a general steel strike, war or no war. This brought what the union probably knew it would bring.

It aroused the White House to the action the Union desired. The President sent identical telegrams to Mr. Murray and a number of steel executives, urging them to keep steel flowing—and giving the union assurance of retroactive pay in case of a wage increase. So the President became the arbiter in this case as in other wage cases and there is every reason to believe that he will decide the present steel wage case. The "basic steel" panel will make its recommendations to the WLB and apparently the board will make its recommendations to the President for his action—through formal announcement by the board.

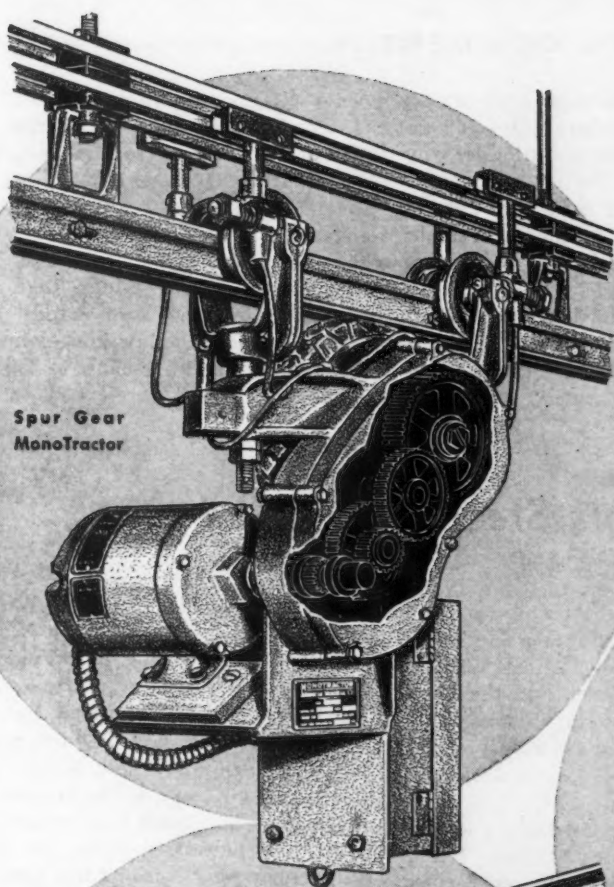
THE industry has repeatedly said in effect what was said by Vice President J. M. Larkin of the Bethlehem Steel Co. that: "In its demands for guaranteed annual wage, sick leave with pay, group insurance, etc., the union seeks to establish in the

## EVIDENCE:

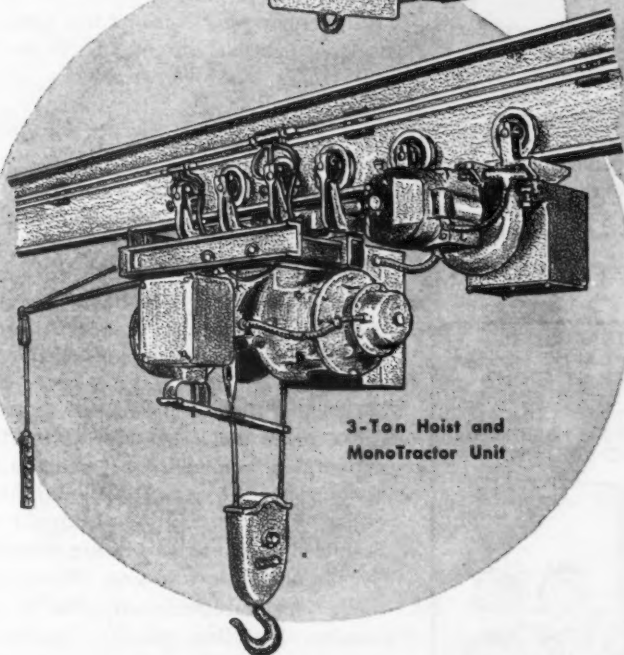
Here are photostatic copies of envelopes containing letters received by the union which have been clearly marked "refused". It is alleged that these envelopes carried letters of resignation by union members during the 15-day escape period. The letters were revealed by the American Rolling Mill Co. in its presentation before the board panel.





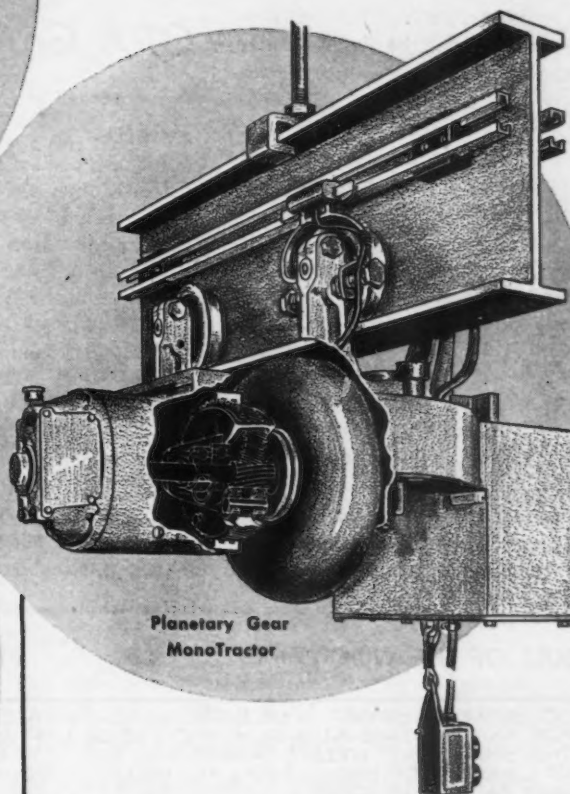


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steel industry a uniform program for postwar social security which goes far beyond the scope of any collective bargaining agreement and which the War Labor Board cannot and should not undertake to impose upon the industry."

But even if it does not grant such demands—and many believe it will not—it is suspected that the board will find a circuitous route, as it did in the United Mine Workers case, to grant a wage increase disguised under another term. In coal, it was portal to portal pay. In steel, some think, a means will be devised to allow a wage increase through the granting of a night differential. This would amount to about 4½¢ an hour, or an additional annual cost to the industry of approximately \$47,000,000, only a little more than 25 per cent of the 17¢ an hour wage increase demanded, though not expected. Whether this would also be "provocative" would remain to be seen. Quite conceivably it would be, particularly on the eve of a Presidential campaign to which the union is contributing so generously. It might well ask for a review, hinting at the necessity of a bigger pay load.

The union has many tricks in its bag. It has demonstrated them often. One of the newest, not to say one of

the shadiest, is its means of trying to coerce its members into permanent contributions to its kitty by way of the check-off. That is to say, the union has resorted to a high-handed means to compel a member to remain a member against his will and desire.

This was revealed by the American Rolling Mill Co. in its presentation before the board panel. Clearly a violation of the escape clause provision, the union coolly writes in

heavy letters the word "refused" on envelopes which it knows carries letters of resignation from its members sent during 15-day escape period. It will be interesting to see what, if anything, is done about this strange hocus-pocus of artful dodging. The resigning members might take the matter into their own hands and would be within the law in so doing by withdrawing and refusing to submit to such attempted coercion.

## OPA Grants Steel Price Relief

Washington

• • • The OPA recently issued two orders regarding changes made in the price of carbon shell steel sold by Follansbee Steel Corp., and the price of wrought iron bars, Grade I, to specification Bureau of Ships, 46-I-7 (INT) sold by the Logan Iron and Steel Co.

Follansbee had requested an exception of Revised Price Schedule No. 6 to increase the base price on carbon shell steel from \$52.00 per gross ton to \$67.00 per gross ton, f.o.b., Toronto, Ohio. OPA granted that Follansbee be permitted to sell at a maximum base price of \$65.00 per gross ton, to which applicable extras for carbon

shell steel could be added. This was \$2.00 a ton under the requested change.

Logan, in requesting permission to sell wrought iron bars at \$8.65 base per 100 lb., f.o.b. Burnham, Pa., as against the ceiling of \$7.40 per 100 lb., under Price Schedule No. 6, was granted only a part of the desired increase. The maximum base price that Logan was permitted under the OPA ruling for wrought iron bars, Grade I to specification Bureau of Ships 46-I-7 (INT) is \$7.90 per 100 lb., f.o.b. Burnham, Pa.

## Propose Simplified Practice For Safety Valve Production

Washington

• • • A proposed simplified practice recommendation for iron and steel relief valves for petroleum, chemicals and general industrial services, has been submitted to producers, distributors, users and others interested for approval or comment, according to an announcement by the Division of Simplified Practice, National Bureau of Standards. These valves are primarily intended for air, gas, vapor and liquid service requirements for oil refineries, gasoline plants, synthetic rubber projects, and chemical plants; also for general industrial service.

The development of this recommendation was undertaken at the request of the WPB Shipbuilding Division and is one of several such recommendations proposed for the purpose of insuring adequate production of all types of safety and relief valves for all needs. Mimeographed copies of the proposed simplified practice recommendation may be obtained upon request to the Division of Simplified Practice, National Bureau of Standards, Washington 25, D. C.

## THE BULL OF THE WOODS

BY J. R. WILLIAMS





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Now—for the first time—standardized air gage spindles and components for checking long, short, through or blind holes at the gage or remotely at the machine or bench. You can write your own specs!

No more engineering time and charges! Deliveries shortened to a matter of days. Interchangeability of spindles and components enables adoption of complete air gaging program at minimum cost and minimum gage inventory.

No more GO and NO GO checking of internal diameters. Both tolerance limits are checked in one pass faster than either could be checked with a plug gage. Frequent, time-consuming and therefore costly, inspections of gages are eliminated.

Precisionaire spindles outlast plug gages 10 to 40 times.

No more human element of error when you use the Precisionaire. Parts with tolerances ranging from .005" to fractions of .0001" can be checked quickly by unskilled and untrained operators who merely present the gage to the part or vice versa.



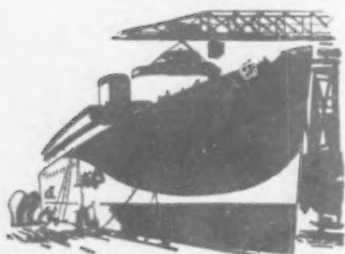
WRITE for Engineering Data No. 12 detailing STANDARDS and also showing SPECIAL applications.

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INSTRUMENTS • CONTRACT SERVICES

• Postwar problems of smaller plants on West Coast pose \$64 question . . . More competitive base prices for steel believed in sight.



**S**AN FRANCISCO — What probably concerns Alden Roach most as he and his directors try to plan and plot the progress of Consolidated Steel Co. of Los Angeles for the next decade?

Which problem is at the top of Charles C. Moore's list as he and his associates consider the future of the Joshua Hendy Iron Works of Sunnyvale and its affiliated far western industrial plants and interests?

Is there a \$64 question that Howard Tallerday would like to have answered for Western Pipe & Steel Co., or Ed Soule for his Soule Steel Co., or Harry Banfield and Edward C. Sammons for Iron Fireman Mfg. Co., or Paul Pigott for Pacific Car & Foundry Co.?

In the welter of discussion and the columns of speculation over Kaiser's Fontana and Geneva, about what steel, aircraft and other manufacturers may do, have the planners and dreamers whose oyster is the Pacific area given due thought to the vigorous and greatly stimulated independent industrial fabricators and processors who have passed from pigmy infancy into vigorous young manhood during the past four or five years?

These have been nourished on a rich vitamin diet of maritime and ordnance contracts and subcontracts and have shared the war born indus-

trial bounty which Col. K. B. Harmon of Army Ordnance and Carl W. Flesher for U. S. Maritime Commission, working principally through the Kaiser, Bechtel and such great contractors, have provided.

Excluding foundries and custom operators the following is a partial list of such principal independent processors, fabricators and manufacturers:

In southern California, Consolidated Steel Co., Axelson Mfg. Co., Byron Jackson Mfg. Co., Norris Stamping Co., Pacific Tube Co. and U. S. Spring and Bumper Co.

In central and northern California, Joshua Hendy Iron Works, Hall Scott Motor Co., Rheem Mfg. Co., Soule Steel Co., Western Pipe and Steel Co. and Yuba Mfg. Co.

In the Pacific Northwest, Iron Fireman Mfg. Co. and Willamette Iron & Steel Co., at Portland, and Isaacson Iron Works, Kenworthy Motor Truck Co. and Pacific Car and Foundry Co., at Seattle.

Such a list might be considerably lengthened, but at least it can be said that the firms suggested have important and significant general shop and tool equipment and manufacturing facilities which could be adapted to a wide variety of finished products, and each must have a major tonnage of ferrous material to continue postwar in anywhere near the volume now being handled.

**M**OST of these concerns are privately owned and financial statements are available for seven to indicate the size of their facilities. Aggregating common and preferred stock, earned and paid in surplus, and notes payable to banks, the following capital structure figures are of interest.

Consolidated Steel Co., \$11,300,000; Axelson Mfg. Co., \$8,000,000; Western Pipe and Steel Co., \$7,200,000; Iron Fireman Mfg. Co., \$5,900,000; Rheem Mfg. Co., \$5,500,000; Byron Jackson Mfg. Co., \$2,700,000; and Pacific Car and Foundry Co., \$2,700,000. Thus, for only seven, the total combined capital is \$43,300,000. It is safe to estimate that the aggregate manufacturing facilities and working capital of all 17 firms must be in the neighborhood of \$75,000,000. Each is in the class of

"smaller war plants," because none employs more than 500 persons (outside of shipbuilding).

Before the war, each of these firms confined itself to supplying local needs and requirements, building gold dredges or special logging equipment, oil well supplies or the bridges, buildings and special custom fabrications, and assemblies that a new and growing frontier area required. These were the overgrown blacksmith, machine shops and special builders who supplemented national producers and who would take the hard special jobs that were usually expensive and non-competitive.

With modernized, greatly enlarged plants, improved facilities and trained production personnel, these concerns are now ready and anxious to continue sizable manufacturing programs. Each looks longingly at standard products in railroad equipment, the petroleum industry, logging, earth moving and marine supply, and even at household and electrical equipment. Managements point out that west of the Rocky Mountains there is not a single manufacturer of electric welded chain, nor of screws, nor of cast iron pipe, and there is only a single tubular plant. They are situated in an area which postwar will probably have a population of from 12,000,000 to 15,000,000 persons and a sufficiently sizable buying power to raise its prewar industrial sites. Moreover, these planners would like to ship to Alaska, Hawaii, the west coast of Central and South America and over the Rockies into Texas and the Midwest. War has reversed the usual law of industrial growth for them, so that they find themselves with modern, improved, efficient industrial facilities and a trained working force, but without a sufficient immediate local market to continue war-sized operations.

**"I**F we could count on our raw materials," they say, "our plates and shapes, bars, pierced rounds, skelp and strip, tinplate, forging ingots, billets and foundry products at somewhere near eastern base prices, we wouldn't fear any competition. Intercoastal ships and freight trains run both ways, and with something like an even break on raw materials, we'd like to make



# Voyage

## THAT NEVER ENDS

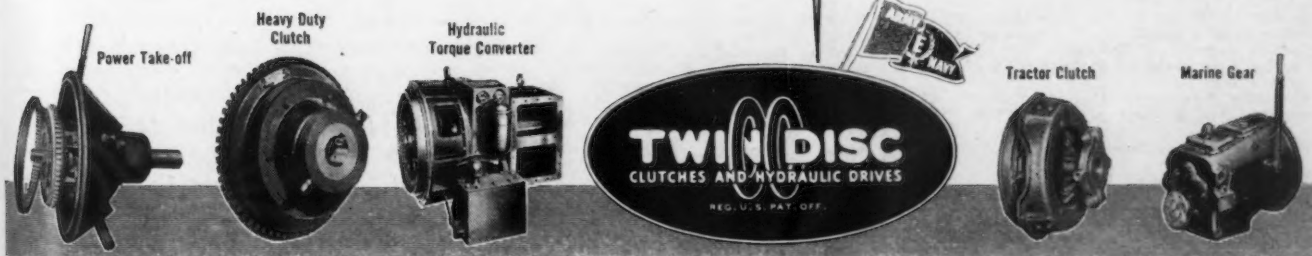


It was many years ago that this man—then merely an ambitious lad—set out to reach a ship's bridge. On his way up, the captain learned a great deal from books, from older hands. An apt pupil of experience, learning is still to him like a voyage that never ends. It's this knowing how to use knowledge gained through experience that keeps him on top.

It pays to look for that same quality when considering clutches or power links to connect driving and driven units of equipment you buy or build. Twin Disc Clutches and Hydraulic Drives have that sort of background in the more than 26 years the Twin Disc Clutch Company has devoted to designing and building power links for industrial application.

Today, three things keep Twin Disc products on top—make them the best buy for your clutch dollar. (1) Application experience that tells how the job you need done can be done best. (2) Intimate knowledge of the materials, techniques and methods required to build *exactly* the right clutch for your equipment. (3) A nationwide organization of factory branches and service stations to give you quick action at any time.

Consult Twin Disc engineers for complete information on both Twin Disc Clutches and Hydraulic Drives. You'll get expert, unbiased help toward efficient, faithful transmission and control of power that will add greatly to the service-value of the equipment you manufacture. **TWIN DISC CLUTCH COMPANY**, Racine, Wisconsin (Hydraulic Division, Rockford, Ill.).



eastbound shipments for a while further than was our competitive limit prewar."

Base prices for finished and semi-finished iron and steel at every point on the West Coast have always been the eastern seaboard base plus the intercoastal water freight rates of approximately 55c. per 100 lb. or \$11 a ton. Because of this universal handicap to Pacific secondary manufacturing and processing, with limited facilities, it has usually been possible for national producers to ship finished products to the West Coast landed to sell at approximately the same price per pound or per ton that the raw material would cost the far western producer.

Principal West Coast steel mills have been owned and operated by Columbia Steel Co., U. S. Steel Corp. subsidiary or by Bethlehem Steel Co., and a handful of small independents with bar and light shape facilities have rather universally followed eastern base plus cost of water freight in computing their selling prices.

To survive postwar, to hold these wartime gains, to nourish heavy industry on the West Coast, these independents are beginning to believe that a lower, more competitive base for raw material is in sight for them if they collectively do something about it. They are inclined to agree with the politicians and anti-monopolists that if and while the Geneva mill in Utah is operated by a govern-

ment subsidiary, taking orders from every one, or by a U. S. Steel Corp. subsidiary, taking orders from the directors and general management in Pittsburgh and New York, there is scant probability that anything lower than the eastern basing point plus may be expected. However, they have been told and assured until they believe that pig iron, ingots and plates and shapes can be produced at Geneva as cheap if not cheaper than at any other point in the United States. If this mill could pass into private independent western hands at a sufficient discount to be able to produce competitively, if conversion is not prohibitive, and if railroads grant low enough rates to the West Coast to land finished and semi finished steel on a roughly competitive basis, these young industrialists and others like them will take a crack at any competition, for they believe the productivity of their labor, the enterprise of their engineering staffs and the competence of their production and sales management is equal to any and superior to most.

So a nebulous movement has begun and the thought has been implanted that western independents whose very life and future depend upon competitive raw material should band together to support and pledge their collective troth to some enterprise to take over Geneva, postwar, and operate it for the sole purpose of encouraging western industry

by supplying competitive raw material.

In such speculation and prospect the Fontana plant should likewise be considered. Its capacity is a little more than half Geneva's, roughly equal to the aggregate of Columbia's and also of Bethlehem's Pacific Coast mills.

There have been some who believe that because of location, assembly and traffic costs, Fontana will not be able to ship to points outside of southern California under the stress of postwar competition. Adjusted rail or coastwise rates and the possible introduction of petroleum coke might well affect if not overcome this handicap.

Others have advanced the suggestion that the Kaiser trend is toward an integrated, follow-through plan of operation whereby it will completely process its own raw materials and offer finished products to ultimate consumers. Although a few straws indicate a breeze in this direction, the die is not finally cast. The Kaiser steel management is pledged to get its operating costs down to a meet-competition basis postwar and the daring enterprise and resourcefulness of the whole Kaiser organization in its various ramifications have probably done more to stimulate the industrial growth of the entire West Coast than any other single influence.

Therefore, if independent processors and fabricators on the West Coast could have two separate sources of raw material supply, each pledge whole-heartedly to the up-building of Western industry and each with all its irons and its whole heart in this fire, the consequent smoke and flame might well produce quite a heat.

Builders of the West, Inc., is a new non-profit organization dedicated to the development of the West with the 11 far-western states as its field of operation. Encouraged originally by members of the Associated General Contractors, it is becoming a sort of clearing house and industrial Chamber of Commerce for the entire area. There are those who believe that its work would be practically done and its mission largely accomplished if in one way or another, by government aid or through private enterprise or both, a base price on finished iron and steel within, say, \$3 or \$4 or at the most \$5 a ton of Pittsburgh, Chicago, Birmingham and Baltimore, might be assured at Los Angeles, San Francisco, Portland and Seattle postwar.

### ... Cited for Awards ...

• • • The following companies have won the Army-Navy E award for outstanding war production:

Pratt & Litchworth Co., Inc., Buffalo. (second star)  
Martins Ferry Division, Blaw-Knox Co., Martins Ferry, Ohio. (star)  
Clark Tractor Division, Clark Equipment Co., Battle Creek, Mich.  
Union Wire Rope Corp., Kansas City. (fourth star)  
Adel Precision Products Corp., Huntington Precision Products Division, Huntington, W. Va.  
Aerovox Corp., New Bedford, Mass.  
Allen Boat Co., Harvey, La.  
American Bosch Corp., Springfield and Chicopee Plants, Springfield, Mass.  
Aviation Corp., American Central Mfg. Corp., Connersville, Ind.  
Burlington Brass Works, Burlington, Wis.  
Commercial Crystal Co., Lancaster, Pa.  
Cornell Forge Co., Chicago.  
Curtiss-Wright Corp., Propeller Division, Indianapolis.  
Equitable Equipment Co., Madisonville, La.  
Exact Level & Tool Mfg. Co., Inc., Highbridge, N. J.  
Ford Motor Co., Somerville Branch, Somerville, Mass.  
Hardwicke-Etter Co., Sherman, Tex.  
Highway Steel Products Co., Chicago Heights, Ill.  
Jones & Laughlin Steel Corp., Otis Works, Cleveland.

Josten Engineering Co., Owatonna, Minn.  
Neponset Woolen Mills, Canton, Mass.  
Port Houston Iron Works, Houston, Tex.  
Republic Gear Co., Detroit Bevel Gear Co., Detroit.  
Ross Mfg. Co., Chicago.  
C. H. Schnorr & Co., Springdale, Pa.  
Southern Aircraft Corp., Garland, Tex.  
Stiles, Inc., Grand Rapids, Mich.  
United States Flare Corp., San Fernando, Cal.  
Universal Microphone Co., Inglewood, Cal.  
Vanity Fair Mills, Inc., Vanterial Corp., Reading, Pa.  
Woodworking Industries, Inc., Grand Rapids, Mich.

#### Maritime M

Colonial Foundry Co., Louisville, Ohio. (star)  
C. Lee Cook Mfg. Co., Louisville. (star)  
Dohrmann Hotel Supply Co., San Francisco. (star)  
Los Angeles Steel Casting Co., Los Angeles. (star)  
Monarch Forge & Machine Works, Portland, Ore. (star)  
Stearnes Co., Chicago. (star)  
Wickes Boiler Co., Saginaw, Mich. (star)  
Air Preheater Corp., Wellsville, N. Y. (second star)  
Air Reduction Co., Inc., New York. (second star)  
Bevis Machine Co., Middletown, Ohio. (second star)  
General Cable Corp., New York. (second star)  
Ingalls Iron Works, Birmingham. (second star)  
Birmingham Tank Co., Birmingham. (second star)



# MORE ACCURATE HYDRAULIC PRESSURE CONTROL

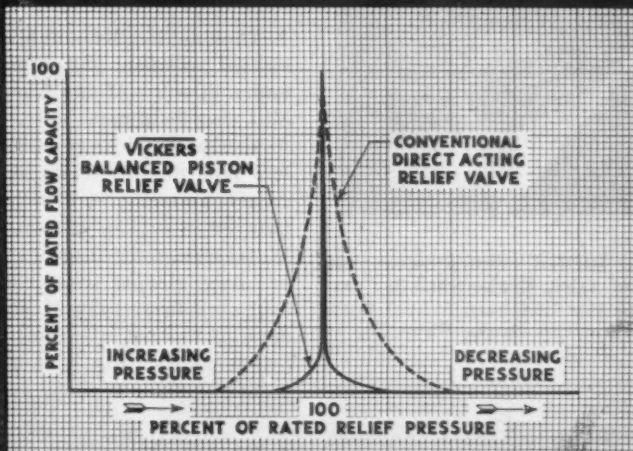
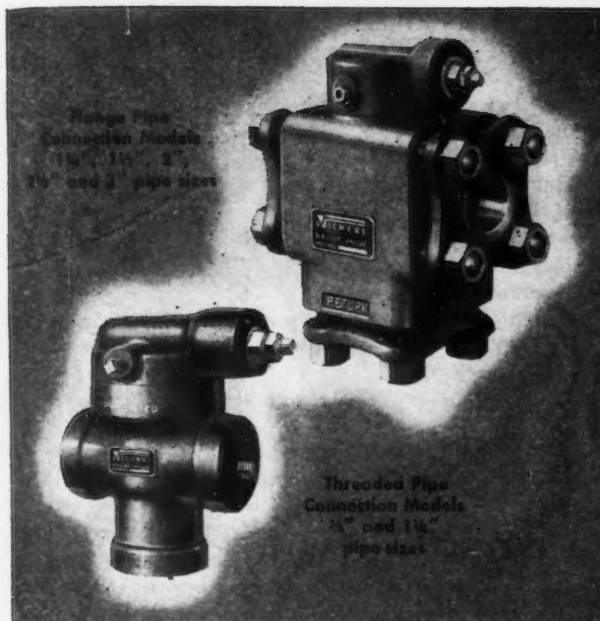


CHART SHOWS PRESSURE READINGS OBTAINED DURING A VARIATION OF FLOW RATE FROM ZERO TO MAXIMUM AND BACK TO ZERO

## VICKERS Balanced Piston Type RELIEF VALVES

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This accuracy of control prevents pressure override when sudden changes in pressure occur in the hydraulic system. Compact design, longer operating life, installation directly in the pressure line, quiet operation, and simple adjustment are other advantages of these Vickers Balanced Piston Relief Valves. See Bulletin 38-3 for complete information.

Vickers Application Engineers will gladly discuss with you how Vickers Hydromotive Controls can be used to your advantage.

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VARIABLE DELIVERY  
PUMPS

# PERSONALS

• • •



**FRED P. BIGGS**, vice-president in charge of sales, Brake Shoe & Castings and the Southern Wheel Divisions, American Brake Shoe Co.

• **Fred P. Biggs** has been appointed vice-president in charge of sales of the Brake Shoe & Castings Division and the Southern Wheel Division, American Brake Shoe Co., New York. Mr. Biggs first came to Brake Shoe as sales inspector in 1916; was appointed assistant vice-president of the company with headquarters in Chicago in 1934, and vice-president of the Brake Shoe & Castings Division in 1938. **Stephen S. Conway** has been appointed assistant vice-president of the Brake Shoe & Castings and the Southern Wheel Divisions. Mr. Conway has been with the company since 1912.

• **Clarence E. Baittinger** has been appointed vice-president in charge of research and engineering, and **J. Howard Shain** has been made production manager, Penn Metal Corp. of Penna., Philadelphia.

• **Eugene Caldwell**, formerly general manager, Willamette-Hyster Co., Portland, Ore., has been elected a vice-president. **Frank L. Ross**, manager of the eastern division of the company at Peoria, Ill., has been named a vice-president and member of the board of directors of that organization. He will continue his activities in charge of all mid-western and eastern programs.

• **Paul H. Setzler** has joined the engineering staff of the United Welding Co., Middletown, Ohio, as consulting engineer.

• **William M. Caldwell**, until recently senior business specialist in the gray iron and malleable castings section of the Office of Price Administration, has been appointed assistant to the executive vice-president of the Gray Iron Founders' Society.

• **Thomas F. McLaughlin** has been elected president and general manager and a director of the Eastern Rolling Mill Co., Baltimore. Mr. McLaughlin formerly was vice-president of Rustless Iron & Steel Corp. and more recently assistant to the president of Crucible Steel Co. of America. **Gordon W. Russell**, a director of the company, has been elected treasurer and assistant secretary. **John M. Curley**, president of Industrial Steels, Inc., Cambridge, Mass., has been elected a director of the company.

• **John G. Farrar** has been elected comptroller of the General Electric Co., Schenectady, succeeding the late **Ira D. LeFevre**. Mr. Farrar had been assistant comptroller since 1936.

• **Max Traum**, former vice-president of Sacks-Barlow Foundries, Inc., Newark, N. J., has been elected president of the company. He succeeds the late **David L. Sacks**. Mr. Traum has been associated with Sacks-Barlow for the past 24 years.

**MAX TRAUM**, president, Sacks-Barlow Foundries, Inc.



**H. H. FULLER**, vice-president, Bethlehem Steel Co.

• **H. H. Fuller** has been elected vice-president in charge of West Coast steel activities of Bethlehem Steel Co., Bethlehem, Pa. Mr. Fuller succeeds **W. H. Stewart** who has held the office for the past 12 years and who, though retiring from active duty, will continue in an advisory and consulting capacity. **Bennett C. Macgregor** has been named general manager of Central sales; **C. M. Mackall** and **C. H. Cecil** have become managers of sales at New York and St. Louis, respectively.

• **Joseph L. Block**, executive vice-president of the Inland Steel Co., who has resigned as deputy director of the WPB Steel Division, will resume his duties at the Inland Steel Co.

• **Russell V. Allman** has been elected president of the Novo Engine Co., Lansing, Mich., succeeding **Rumsey Haynes**.

• **Benjamin Schwartz**, formerly director general of the Institute of Scrap Iron and Steel, and chief of the Scrap Metals Section of Foreign Economic Administration, has been elected executive vice-president and a member of the board of directors of New York Commodities Corp. Mr. Schwartz, who will continue as scrap consultant of FEA, has resigned as chief of the scrap metals section in Washington.

• **L. G. Gilmore** has been appointed advertising manager, National Battery Co., St. Paul, Minn.





**RICHARD T. COYNE**, manager of sales, Mt. Vernon Car Mfg. Co.

• **Richard T. Coyne** has been appointed manager of sales for Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill., a division of H. K. Porter Co. Inc., Pittsburgh. He will assume the duties of **C. M. Wright**, formerly vice-president, who has resigned, and will divide his time between his headquarters in the Chicago office and the plant at Mt. Vernon. Mr. Coyne was formerly with the Enterprise Railway Equipment Co.

• **Charles R. Hook**, president of the American Rolling Mill Co., Middletown, Ohio, has been awarded the degree of Doctor of Engineering by Stevens Institute of Technology.

• **James F. Howard** and **E. G. Gardner** have been appointed vice-presidents of the National Enameling & Stamping Co., Milwaukee. Mr. Howard has been with the firm since 1926, was elected secretary and treasurer in 1934 and will continue in that capacity. Mr. Gardner joined the firm in 1939 as factory manager of the Milwaukee branch and at present is in charge of manufacturing at the company's five plants.

• **J. M. Strelitz**, has been made chairman of the board, Marion Steam Shovel Co., Marion, Ohio. He has been a director of the company since 1931 and its general counsel for the past 20 years. **C. F. LaMarche** was appointed president and general manager. Mr. LaMarche has served the company as a director since 1939.

• **Louis M. Kuilema** has been appointed manager of sales in the new district office at Cincinnati, of the Pennsylvania Salt Mfg. Co., Philadelphia. He was formerly with the Hercules Powder Co.

• **F. C. Greenhill**, vice-president of the Acklin Stamping Co., Toledo, has been elected president of the Pressed Metal Institute; **J. H. Robins**, president of the American Pulley Co., Philadelphia, was elected vice-president and **T. J. Smith, Jr.**, of Cleveland and Huntington, W. Va., was appointed executive vice-president.

• **Jean Wynkoop** has been appointed to the organic research staff of Turco Products, Inc., Los Angeles.



**M. J. ZIVIAN**, president, Detroit Steel Corp.

• **M. J. Zivian**, has been elected president of Detroit Steel Corp. He has been with the company since its inception in 1923. **J. B. Ribakoff**, former president of Reliance Steel Corp., has been made general manager of the new Reliance Steel Division of Detroit Steel Corp. at Cleveland. **Joseph P. Pulte** has been named general manager of the Mill Division, Detroit, and **Robert D. Kelley** has become president of the Craine-Schrage Steel Co., a subsidiary of Detroit Steel Corp.

• **William R. Thompson**, formerly manager of stainless sales for Jessop Steel Co., Washington, Pa., has become associated with the stainless products sales department of Pittsburgh Steel Co., Pittsburgh.

## OBITUARY...

• **Frank R. Frost**, president of Superior Steel Corp., Pittsburgh, died June 29 at the age of 61. Mr. Frost joined Superior Steel Corp. as a salesman 18 years ago. He subsequently served as assistant sales manager, general sales manager, vice-president and director. He was made president in 1927. Mr. Frost was a director of the American Iron and Steel Institute.

• **Julius Uihlein**, founder and former president of Julius Uihlein & Co., Cincinnati, manufacturers of steel products and tools, died June 20. Mr. Uihlein was 86 years old.



**FRANK R. FROST**, deceased, president, Superior Steel Corp.

• **William H. Crosby**, 81, chairman of the board, Crosby Co., Buffalo, died June 26. He founded this sheet metal stamping company 48 years ago, and was its president prior to becoming chairman of the board.

• **Raphael Lavin**, 85, founder and chairman of the board of R. Lavin & Sons, Inc., Chicago, died June 26.

• **E. E. Lombard**, superintendent of the Mercer Tube Co., Sharon, Pa., died recently. He was 58 years old.

• **William P. Laytham**, president, William P. Laytham & Sons Co., Inc., Paterson, N. J., died June 2.

• **Allen H. Nugent**, assistant to the vice-president of the American Can Co., New York, died June 24.

# Fatigue Cracks . . .

BY A. H. DIX

## He Objects to Our Hobby

So you think Oveta Culp Hobby is a musical name? I shudder at the mere mention of those dissonant syllables. Compare "Oveta Culp Hobby" with "Olivia de Havilland." They'd never let that name stand in the movies. But perhaps you are kidding.

—Willard G. Myers

We are deadly serious and we stand our ground even though Willard G. Myers heads the advertising agency of the same name, which places several accounts in your favorite family journal, and when you are in the publishing business an advertising agency stands somewhere between a full admiral and the Holy Trinity.

The adjective "musical" has a far more catholic meaning than Mr. Myers grants. We, too, melt to the syrupy strains of "The Sweetheart of Sigma Chi" but the crashing opening chords of Rachmaninoff's Prelude in F are also music, and Colonel Hobby's name is that kind of music.

As to the relative worth of Hobby and Haviland as movie names, the current trend among star-namers is definitely away from the oleaginous toward the mildly abrasive. We would cite examples, but our magazine files are cursed with narrow functionalism, and none of the girls reads anything lighter than the *Saturday Review of Literature*. If, however, Mr. Myers wants to make an issue of it we will write out an expense slip for 25c., buy a copy of *Screen Topics* at the Grand Central newsstand across the street, and overwhelm him with evidence.

Offhand, there are the three Conover girls, rechristened Choo-Choo Johnson, Chili Williams and Dusty Something-or-Other. Compare these with the oily syllables of "Olivia de Haviland."

## A Name to Remember

• • • Before we mislay the timetable on which we wrote it we would like to get into the record another cognominal nugget we stumbled upon the other day. The newcomer to our gallery of notable names is the British Parliamentary Secretary to the Ministry of Economic Warfare, Dingle Mackintosh Foot. Will he please stand between Colonel Oveta Culp Hobby and Dr. Icie Macy Hoobler.

## Blurb

While fishing at Beaverkill recently I met an International Business Machines man who was entranced with something he said he read in your page about lead and the metal industry, playing on the phrase, "Get the lead out of your pants."

I don't remember seeing it. He probably saw it somewhere else.

—Deac

The gem is ours. On Feb. 10 we commented on the Gray Iron Founders Society's righteous indignation over the simile "as brittle as cast iron," and asked, "Is the Lead Association sensitive to the use of its product's name in a picturesque objurgation conveying contempt for inaction?" We were moderately proud of it at the time and are grateful to the IBM fisherman for remembering it.

## Firearm Inexperts

• • • Another IBM man clips an advertisement from a recent issue and sends it to us with this note:

I judge from the photograph that the enemy has established a beach head in a Connecticut hardware store. Note the desperate situation of the Yank as he swings his Mossberg No. 42 M. .22 cal. rifle, while the Nazi threatens him with a Bridgeport-made Tommy gun that is lacking its magazine, and which he has neglected to cock.

A corsage of dandelions to the censor in your advertising department for letting this get in. Does he think that we ordnance contractors fail to read the ads?

—C. C. Rutbell

Since we moved away from the shooting galleries in the Times Square area to the severer confines of Park Ave. and East 42nd St. the staff's scant knowledge of firearms has sunk to zero. But if the illustration had shown someone underplaying a trump lead in a pinochle game or serving a Martini in a Manhattan glass dozens of disapproving eyes would have popped.

## Pot Scraper Plea

• • • Now that the WPB has granted permission to make 46 million wire coat hangers we hope it will next wave a beckoning finger at the manufacturers of those little bundles of shredded metal that are used in scraping pots and pans. We home front soldiers can carry the cross of collapsing cardboard coat hangers with far less chafing than the ersatz pot scrapers cause.

We own stock in no pot scraper outfit. We do not even know a pot scraper maker, but we will put the full power of our L. C. Smith typewriter into a campaign to get metal pot scrapers back into the kitchen. We would also like one for our garage, as the one we have been using for years in cleaning the once whitewall tires on our 1940 Dodge is practically bald.

If need be we will ask the chief of our potent Washington bureau, Leon Wesley Moffett, or his helpers, Don Browne and Gene Hardy, to drop a word into the right ear in the Office of Civilian Requirements.

## Latter-Day Demosthenes

• • • The right ear may be that of Dr. Elliott, the OCR chief, whom we will soften up by naming as one of the most persuasive public speakers we have ever listened to. About twenty-four out of every twenty-five speeches can be missed with no loss, but Dr. Elliott is the twenty-fifth speaker. He could address the Canarsie Chowder and Marching Club after the fifth barrel had been tapped, talk on Assyrian cuneiforms' origins, and have the members sitting on the edge of their chairs.

## Non-Spirituous Magnet

• • • Your chances of hearing Dr. Elliott and other Washington officials are now much less than they were, for the heavy burden on the railroads has induced the Office of Defense Transportation to conduct a "no-convention" drive. It has enlisted the co-operation of other Government departments, and reports in a recent press release:

Specific action has been reported so far by thirty-one Government departments and agencies to cut down travel by their employees and to eliminate the Government official as a convention attraction . . .

The bold face is our own, introduced to simulate the underscoring by a brains department member who pencilled on the bottom of the release, "I've always felt the attraction was the Bourbon."

## Puzzles

Last week's steady-driving A makes it in 4 hrs. B takes 4 1/6 hrs.

A man after our own heart is C. C. Finn, of the John Finn Metal Works, Seattle, who writes:

I did the June 8 match puzzle in an hour and ten minutes. I believe I have failed on all your other puzzles except one.

We are a misomath ourself, and without our puzzle book we are as naked mentally as an M.P. without his armband. Now that Mr. Finn has broken the ice, he may find this easy. If he solves it in less than ten minutes we will be glad to appoint him commander, Northwest Division, of this page's loyal army of eighteen readers:

Write 31 using only the digit 3 five times.



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industries and the welfare of nations.

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# Scales

# Dear Editor:

## GEAR TOOTH FORMULA

Sir:

In your June 1 issue under the heading "Gear Manufacturers Approve New Standards," John O. Almen, of General Motors Corp., cites the McMullen-Durkan method for modifying the Lewis gear-tooth load-capacity formula. What is this method and where can I obtain particulars?

A. WOODALL SMITH,  
Chief Engineer

Rice & Adams Corp.,  
Buffalo, N. Y.

• The McMullen-Durkan formula is described in a paper Mr. Almen presented some years ago before the American Gear Manufacturers Association, entitled, "Factors Influencing the Durability of Automobile Transmission Gears," Part II, as applied to spiral-bevel gears. This paper also gives the preferred method of calculating stress in helical and spur gears based on a method proposed by Charles H. Logue. Mr. Almen, who is head of the Mechanical Engineering Dept. 1, Research Laboratories Div., General Motors Corp., P. O. Box 188, North End Station, Detroit, writes, "In calculating the durability of spiral bevel gears, we use the McMullen-Durkan method with some modification. In all probability, many other satisfactory formulae can be found since it is only necessary to apply any formula that will arrange the test points upon a predictable curve as is described in my paper." Mr. Almen is forwarding a reprint of his paper.—Ed.

## CASE-HARDENED DEPTH CHECKS

Sir:

Where can I obtain information on non-destructive methods of checking depth of carburize and nitride cases?

LEONARD ROACH,  
Resident Inspector

Curtiss Propeller Div.,  
c/o Steel Products Engineering Co.,  
Springfield, O.

• If the amount of checking to be done is limited, you might use the Rockwell equipment. If a production set-up is required we recommend you investigate the equipment made by the Magnetic Analysis Co., 42-40 12th St., Long Island City, N. Y., and the Cyclograph, made by DuMont Laboratories, Passaic, N. J., also a device recently put on the market by Waugh Laboratories, 420 Lexington Ave., New York.—Ed.

## SUPERSONICS—ULTRASONICS

Sir:

Will you please send us clippings of your articles, "Sheet Fractures Detected with Supersonics" in your June 8 issue, and "Ultrasonics — New Metallurgical Tool" in your May 15, 1941, issue? Do you know of anyone manufacturing this equipment?

J. H. MITCHELL

Revere Copper and Brass, Inc.,  
Rome Mfg. Co. Div.,  
Rome, N. Y.

Sir:

Your Jan. 6 "News Front" mentions a method of testing forgings and castings sonically. We are much

interested in this method of testing and would like additional information.

ROLAND C. BERGH,  
Chief Research Engr.

Republic Aviation Corp.,  
Farmingdale,  
Long Island, N. Y.

• All the developments we have reported upon are English and German. Very little has been published on the work either abroad or here. The only company we know of that has done much with this potentially valuable method of testing is Sperry Products, Inc., 1505 Willow Ave., Hoboken, N. J.—Ed.

## BABBITT-SAWER

Sir:

Having been responsible for the development and use of the saw mentioned on page 65 of your May 11 issue, under the title, "Sawing Babbitt Bearing Linings," I would like to mention a fallacy in the description.

Paragraph 2 and Fig. 2 refer to a bar guide for lining up the split in the casting with the saw blade. This is not the case. The bar guide was originally placed on the saw to steady the saw arm if there was any tendency to vibrate or run to one side. The bar is not essential.

The joint of the bearing is centered with respect to the saw blade using a knife edge is held in place by a spring, and to revolve the bearing for the second cut, the knife edge is disengaged by a movable shaft and handle (Fig. 1, lower left).

C. J. PLOVANICH,  
Metallurgical Section

General Electric Co.,  
Pittsfield Works' Laboratory,  
Pittsfield, Mass.

## ELECTROLYTIC CLEANING

Sir:

An item we are producing for the aircraft industry calls for a gear with an internally cut spline in a blind hole. In the heat treating process a certain amount of sediment and a small amount of scale adhere to the internal surfaces, causing considerable trouble in fitting the mating part.

To my knowledge, an acid dip would not be suitable for cleaning these. It seems to me I read an article some time ago about a composition manufactured for the purpose of cleaning such articles, or do you know of any other method that would work? The hole is about 1½ in. deep, 7/16 in. diameter around which the spline is cut.

F. POSSINGER

51 Meadowbrook Parkway, Sta. A,  
Buffalo 6, N. Y.

• The Bullard-Dunn Division, Bullard Co., Bridgeport, Conn., manufactures electrolytic cleaning equipment. Many articles about this have appeared in The Iron Age. However, complete information can be obtained by writing direct to the manufacturer.—Ed.

## UPSETTING DATA

Sir:

We are anxious to obtain a book covering the operation of upsetting machines, covering every phase of forging machine operation, including setting up and tool design. Can you recommend one?

W. H. LOHMAN,  
Assistant Manager

Acme Tool Works, Inc.,  
3624 Colorado Ave.,  
Seattle, Wash.

• A logical source is the upsetting machine builders: Ajax Mfg. Co., Euclid Branch P. O., Cleveland 17; Acme Machinery Div., Hill-Acme Co., 4533 St. Clair Ave., N.E., Cleveland 14, and National Machinery Co., Tiffin, Ohio. A four-part series on cold heading appeared in our June, 1938, issues. We have no more clippings but you might consult bound volumes in the Seattle public library. Considerable information on upsetting will be found in the "Forging Handbook," issued by the American Society for Metals, 7301 Euclid Ave., Cleveland 3.—Ed.

## TOOL STEEL DIRECTORY

Sir:

We have a copy of your "Directory of Tool Steel" which we obtained from you several years ago. It has a brown cover. I understand that you issued a new directory this year or the latter part of last year. Will you kindly let us know if we can secure any copies, as well as the price?

SALES DEPARTMENT

Atlantic Steel Co.,  
1775 Broadway,  
New York 19

• The first edition of the Tool Steel Directory had a brown cover. The second edition brought out last year had a red cover. The third edition, now on the press, will have a blue cover. Price is \$1 each for five copies or fewer, 50c each for more than five.—Ed.

## NORTHWEST OPPORTUNITIES

Sir:

"Where can we get the booklet, "Pacific Northwest Opportunities," mentioned on page 84, your West Coast section, by Osgood Murdock?

H. W. HOCKETT,  
Plate Shop Supt.

Oregon Shipbuilding Corp.,  
Portland, Ore.

• Write to Bonneville Power Administration, Portland, Ore.—Ed.

## EDITORIAL INDEXES

Sir:

Will you kindly send us a copy of the editorial indexes from 1939 to date, or any that are available for that period. We will be glad to pay any charge.

L. O. LEWTON,  
Research Librarian

Freeport Sulphur Co.,  
122 E. 42nd St.,  
New York 17

• Not all the indexes are available but those that are have been sent you without charge. Upon request the name of any subscriber will be placed on the list to receive the editorial indexes when they are issued the end of each half year. There is no charge.—Ed.





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of Deep Drawn  
STAMPINGS*

# This Industrial Week . . .

- **Steel Production Lags Again Due to Manpower Shortage**
- **Holiday Brings Order Volume Down; Snapback Expected**
- **Optimism Restrained but Postwar Ideas Expand**

**A** FALLING off in the production of steel ingots, a slight hesitancy in the volume of new steel orders, a tendency for industrialists to put more emphasis on postwar plans and no diminution in the number of outlaw strikes were among some of the more important features of the metal working industries such as steel in the past week.

Because of the Fourth of July, although most plants worked through in the blast furnaces and open hearths, the rate was off again this week. This factor is causing so much concern in Washington that WPB has called a special meeting of steel executives, who are members of the Industry Advisory Committee, to find a solution to the falling ingot rate. The manpower shortage, the hot weather, and various work stoppages in the past few months are some reasons advanced for this rate drop. WPB has warned that in recent weeks the raw steel output has declined to the point where the fulfillment of the third quarter steel requirements is endangered.

The tendency for steel order volume to contract is being ascribed to the view on the part of some consumers that it would be unwise at this time to let inventories become unwieldy. Furthermore, many consumers of steel are reminded of the fact that a sudden end to hostilities in Europe would result in wholesale cancellations of contracts. Steel men themselves are also mindful of the fact that when and if the European war ends there will be probably more cancellations or suspensions than will be found to be warranted by later official orders. For this reason, although no industrialists share the optimism that the government has warned against, it is said to be only natural that the war end problems should be recognized and planned for or cushioned. Steel companies this week were noting this trend of thought among some of their consumers.

**T**HE loss in steel output due to manpower shortages was said by the WPB to have amounted to as much as 200,000 tons a month recently. It was said at an industry meeting recently that more than 31 open hearths had been shut down due to lack of labor to run them. In addition to this, production has been slowed up because repairing of the furnaces is taking almost twice as long as under normal conditions due to green labor as well as a shortage of men to take proper care of the rehabilitation. While not affecting steel output to the extent of the manpower shortage, outlaw strikes in the past week have made a dent in the supply of steel to vital war manufacturers. Apparently, according to some steel observers, the successes of the Allies in Europe are being erroneously taken as a sign that the war is "almost over." Orders on steel mill books do not support such an opinion. Production of many of the

more important and urgently needed war items are affected when operations are curtailed at steel mills, whether it be due to manpower shortages or strikes.

Actual order volume this week reached a new low because of the extended holiday in some sales offices. This does not mean, however, that a flood of new orders may not be in the making for the latter part of this week. Deliveries have become so extended on some items that many consumers have shown a reluctance to place orders when promises on delivery are so far ahead. Nonetheless the fact remains that backlogs have not suffered much of a decline because concurrently for the past few weeks the raw steel output rate has dropped to such an extent that the slight decline in orders has lost its significance. There are some, however, who believe that the top heavy volume of steel orders has about come to an end with most of the military plans interpreted into firm orders already. If these orders have not already been placed on the books, it will not be long until they are received. The bulk of these plans will reach the mills by the third quarter. Especially is this true of the shell steel program, the rehabilitation of tanks and the production of other items needed in the various theaters of war.

**T**HAT postwar planning or postwar ideas have taken a spurt recently is evidenced by news from Detroit that speculation is rife that the new motor car may not after all be a facsimile of the 1942 models as had been assumed. Foundation for such speculation is found in the fact that automobile companies like others are allowed to build experimental models. They can also order tooling for their reconversion as long as it does not interfere with production of war items. It is felt in Detroit that the manufacture of civilian cars is indefinitely in the future, undoubtedly six months at the minimum and likely more.

The national ingot rate for the coming week will be down one point to 95 per cent, according to scheduled operations, but because of the holiday week the actual production will probably be below schedule. Pittsburgh is down 2½ points to 89 per cent; Cleveland is off 4 points to 90.5 per cent; Wheeling is 1½ points down to 96.5 per cent; Detroit shows a drop of 3 points to 96 per cent; and the Eastern area is down 1½ points to 90 per cent. Districts showing a rise were: Chicago, up ½ point to 100 per cent; Youngstown, up 2 points to 100 per cent; Southern Ohio Valley, up 1 point to 87 per cent; and Philadelphia, up 1 point to 99.5 per cent. Unchanged were: Buffalo at 104.5 per cent; the South at 97 per cent; the West at 86.5 per cent; and St. Louis at 99 per cent.



• **STEEL DELIVERIES**—Most delivery promises now being made by steel companies run to the end of the year and into the first quarter of 1945 with the exception of some wire items. Hot rolled sheets are running from December to February depending on the company. Plates are being promised in November and January. Forging billet schedules are heavy and new orders are being promised for January. Structural shapes may be had in October and November. Carbon bar deliveries vary from December to January. Alloy bars may be obtained in December while cold rolled sheets are being quoted from December to February. Manufacturers' wire is being promised for October on 12 gage and up and for the first quarter of next year on sizes under 12 gage. Seamless tubing with some plants is bringing a promise of December. Some wire products can be had in August while deliveries for others are running into the third quarter.

• **BARRELS AND DRUMS**—In recent months the trend for steel companies in taking up barrel and drum making companies has been at a fast clip. Now it is said another independent steel barrel maker is soliciting offers or at least trying to find a buyer. This move on the part of the steel companies is a natural one in view of the tremendous steel sheet capacity in the industry. By owning one or several barrel or drum plants the steel company can be fairly sure of an outlet for at least a part of its hot rolled sheet output. A commercial problem is involved where a steel company has its own plants and also sells to independent barrel makers. But the independents now make a small part of the total tonnage of barrels and drums in view of the recent purchases by steel companies.

• **UNFOUNDED OPTIMISM**—There has arisen since the invasion of France, like after the invasions of North Africa, Sicily, and Italy, a wave of optimism that the war is practically over. This time, it's worse than at any other time. The man on the street as well as the business man in his office is guiding his personal and business life on the basis of "What if the war ends quickly?" There has been nothing to indicate a quick knock-out of Germany as yet, and such wishful thinking the Army feels is dangerous.

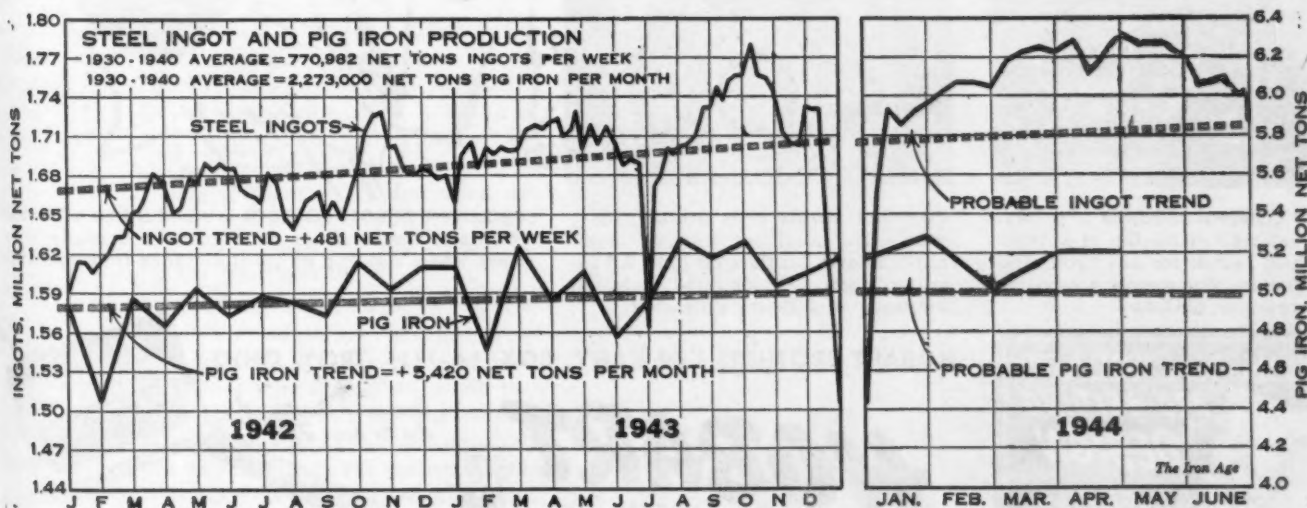
• **SHELL STEEL SPECULATION**—There has been some speculation in and out of the steel trade as to the probability that the huge amounts of shell steel now being planned for will actually be produced. That there is every intention of making this material if it is needed is obvious but the amounts are so large that some analysts are wagging their heads. This situation fits into the general plan that the armed forces must prepare for and put through every order that appears to be needed for any eventuality. Steel leaders are too busy getting out steel orders to indulge in the kind of optimism against which the high military chiefs warned last week.

• **SHELL STEEL FIGURES**—While there appears to be some misunderstanding on the various tonnages of steel to be used for the shell steel program, the basic differences of opinion are not marked. Usually the figures mentioned include only the heavy shell forging requirements. When the smaller caliber and the components are considered the total steel requirements by January, 1944, may run over 500,000 tons a month, unless part of the program is abandoned.

• **PASSENGER CARS**—Reports of railroad passenger car ordering which have been circulating recently refer to tentative orders. Whether or not these orders are completed soon depends on WPB allocation of materials. While the holdup is not so much on carbon steel, aluminum or stainless steel, some components are hard to get. These include air conditioning units, certain electrical equipment, car wheels and axles. It is problematical if any sizable number of passenger cars will be completed even by the end of the first quarter next year, if then.

• **GALVANIZED SHEETS**—The trade is noting that although the WPB has relaxed its orders on the use of galvanized sheets for pails, garbage cans, etc., this move will mean little to the man on the street. Deliveries on galvanized sheets are extremely tight and are for war items at that, so most market analysts believe it will be some months before the effect of the latest WPB order will reach the householder. With respect to the relaxations on aluminum, the metal is present but there is no labor in the fabricating plants to make the household items. WPB orders still limit what can be made for civilian consumption.

## The Iron Age



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
June 29	91.5	99.5	98.0	98.5	94.5	104.5	98.0	97.0	99.0	86.5	86.0	99.0	91.5	96.0
July 6	89.0	100.0	100.0	99.5	90.5	104.5	96.5	97.0	96.0	86.5	87.0	99.0	90.0	95.0

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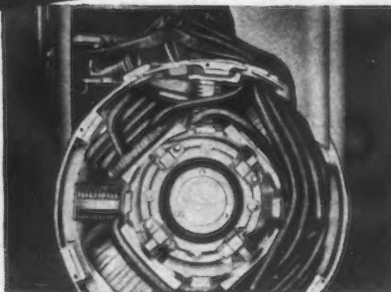
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# Farm Equipment Builders Fear Competition of Tank Program

By C. T. POST  
Chicago Regional Editor

## Chicago

• • • Although farm equipment manufacturers are wary of possible competition with the rejuvenated tank program for parts and components during the third quarter, currently they are happy over output of most implements during the production period ending June 30. Wheel tractor production went over the goal of 200,000 set for the entire year during the first 11 months. It seems possible that the output will be in excess of 225,000 by the end of June, 1944.

Not so rosy, however, is the outlook on harvesting machinery. Combines are lagging and corn pickers have an uphill climb to meet the production season's goal. Both of these items had larger proportional quotas than the tractors.

Because no orders have been given to re-establish primary tank production lines in this district, which manufacture 90 per cent of the country's farm machinery, farm equipment companies are not particularly concerned that their labor and equipment will be drafted. The industry participated heavily in the original tank program. The current upswing in tank production, which most correspondents attributed to unexpected losses during the invasion, actually began here about a month ago. Some losses during the invasion had been anticipated, and the new emphasis is expected to be temporary in nature. A retreat to normal schedules may be effected by the end of the summer, it is expected. Nevertheless, the farm equipment makers just recovering from the competition for components with the truck and landing draft programs are fearful lest the tank provide a conflicting demand for parts and components during the third quarter.

Probably the most universally difficult procurement problem for the industry in the past year and particularly in recent months, has been malleable castings. More than any other single factor these have been responsible for the current difficulty in combine production. Comparatively little demand is anticipated in the malleable field from the tank builders, but engines, engine parts, and bearings are all expected to be required. These items, along with chain, provided conflicting demand during the past year from the truck and landing barge program.

International Harvester Co., cancellation of whose tank contract in 1943 was one of the largest up to that time, has recently received an Army Ordnance contract to rehabilitate and re-



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furbish tanks in preparation for combat. It is not contemplated that tanks will be returned from the battle field, but that units which have been active in maneuvers in this country be modified and refitted to meet modern battle requirements.

Despite the universally tight market situation on flat rolled steel, particularly galvanized sheets, the farm equipment industry appears to have somehow charted its course to avoid difficulty on this classification. Delivery has been obtained in many cases on black sheets as a substitute. Tires, which constituted a severe problem several months ago, also appear to be available in satisfactory quantity.

Direction No. 4 to WPB order No. L-257, issued recently, has satisfied a complaint by small farm equipment producers and producers of specialty machinery that they were not granted even minute amounts of critical materials to be used in conjunction with readily available idle and excess inventories in the production of equipment above assigned quotas. The new direction establishes a reserve of 15,000 tons of carbon steel and proportionate amounts of other controlled materials under third quarter allotments to be used for these purposes. This action will provide immediate relief in areas where specialty crops are grown and where equipment normally is customer-built by local machine shops not qualifying as farm equipment manufacturers. Direction No. 4 also opens the door to participation of manufacturers not already engaged in the production of farm machinery as defined in order L-257, and who are not situated in Group I or Group II labor shortage areas.

## Canada Abolishes Tariffs On Farm Implements and Farm Machinery

Ottawa

••• Presenting his sixth wartime budget in the Canadian House of Commons, June 26, Finance Minister Ilsley announced that compulsory savings on personal income would be discontinued, effective July 1. He also stated that tariffs on farm machinery will be eliminated immediately, along with removal of a 10 per cent war exchange tax on farm implements. Import restrictions on a wide range of luxuries from the United States will be removed on Aug. 1.

Regarding farm machinery and implements which will come into Canada free under the intermediate tariff, the Minister admitted there is a catch in the new policy. Supply of such implements coming into Canada from the United States will not be increased, he said, because they are subject to restricted allocations. He pointed out, however, that Wartime Prices and Trade Board will amend its order serving ceiling prices on imported farm implements and repair parts in such a way as to give effect to any increases in a laid-down cost to importers which will result from the action taken.

In addition to removal of all customs duties and the 10 per cent war exchange tax on agricultural implements, steps also are being taken to remove duties on materials used in the manufacture of these implements, Mr. Ilsley said. Other tariff changes follow:

Duty on glass tubing is reduced,

provision is made for the duty-free entrance of non-metallic heating elements used in high temperature furnaces and the items covering machinists', engineers', surveyors' and draftsmen's precision instruments are widened to include parts.

Duty is removed on trophies of war, materials for the manufacture of artificial teeth and sutures of all kinds.

The nickel chromium content requirement for duty-free entry of bars and rods for the manufacture of electric resistance wire is reduced from 60 to 50 per cent.

Announcing the changes, Mr. Ilsley also dwelt on the government's general tariff policy. As a result of war conditions tariffs at present had little effect on external trade.

The government, however, continued to have "the most lively appreciation" of entering a postwar world which had been freed of wartime restrictions and high tariffs. As the postwar period approached it became increasingly important that Canada, in agreement with other nations, should set out the broad pattern of her trade policy.

In discussions with representatives of other countries, Canada had "pressed vigorously the need for bold initiative in the orderly and agreed unshackling of world trade."

"Considerable progress has been made in the definition and solution of the technical problems involved, and we shall continue to press at the appropriate time for the rapid development of a broad program," Mr. Ilsley said.

Large-scale alterations in the tariff structure would have little immediate effect, and should, if possible, be introduced by reciprocal arrangement with other countries.

The reductions on agricultural implements, however, indicated the direction in which the government was shaping its postwar trade policy, and also gave effect to a desire to provide agriculture with some assurance of the conditions under which it might be expected to operate after the war.

The government's action would not increase the available supply of implements, but the Prices Board will amend its ceiling regulations on imported farm machinery and repair parts to give effect to the decreases resulting from the removal of duties and tax, Mr. Ilsley said.

**GRIM REMINDER:** *Here is the Harbor of Civitavecchia, port of Rome, as it was found by victorious Allied troops speeding through the Eternal City on the heels of the desperately retreating Nazis. Yank bombers accounted for most of this wreckage.*





A duty of 5 per cent on imports from the United States, or any other most-favored-nation country, on articles which enter into the cost of manufacture of almost all agricultural implements and machinery in the list affected has been eliminated when imports are for manufacture of articles of that type.

A duty of \$1 a ton on pig iron and \$2.75 a ton on iron or steel rods or bars used in the manufacture of agricultural implements also has been eliminated.

For a number of years the tariff provided a drawback of 80 per cent of the customs duty paid on materials used in the manufacture of agricultural implements. This drawback has been increased to 99 per cent.

Provision also has been made for duty free entry of articles which enter into the cost of manufacturing twine for baling farm produce. This twine is used principally for baling hay.

Items previously subject to a 5 per cent intermediate tariff which now will be free are: Chain for agricultural implements; spraying and dusting machines; bulb sterilizing apparatus; fruit testing apparatus; pruning hooks; pruning shears; animal de-horning instruments; fruit and vegetable grading machines; fruit and vegetable grating machines; fruit and vegetable washing and wiping machines; fruit and vegetable bagging and weighing machines; machines for topping vegetables; machines for bunching and tying nursery stock; machines for bunching and tying cut flowers; machines for lidding boxes; egg-graders and egg-cleaners and complete parts of these articles.

Previously 7½ per cent and now free; Harvesters, mowing machines, reapers, harvester combines, plows, rollers, farm, field, lawn or garden; soil packers, cultivators, harrows, seed-drills, horse rakes, horse hoes, scufflers, manure spreaders, weeders, hay loaders, hay tedders, hay presses, potato planters, potato diggers, fodder for feed cutters, ensilage cutters, grain crushers.

Grain or hay grinders, post hole diggers, snaths, stumping machines, scythes, sickles or reaping hooks, hay or straw knives, edging knives, hoes, pronged forks, rakes, incubators for hatching eggs, brooders for rearing young fowl, fanning mills, peaviners, corn-husking machines, threshing machine separators, windmills, complete parts of these articles and agricultural implements and machinery, not otherwise specified.

## Predicts That Conversion From War to Peace Will Not Be Difficult

### New York

• • • In terms of dollars and cents, the task of reconversion from war to peacetime production promises to be much less difficult than is ordinarily imagined, according to J. A. Livingston. His views were published by the Public Affairs Committee, 30 Rockefeller Plaza, New York. Mr. Livingston is editor of *War Progress*, a restricted weekly economic report of the War Production Board, but the analysis does not reflect the views of the WPB or its members.

Mr. Livingston, while recognizing that the disposal of government-owned property after the war is a "bugbear" to many businessmen, claims the problem is greatly exaggerated.

The marketable carryover from the war into the peacetime economy is estimated at only \$15 billion. In a country capable of producing goods and services at a \$175 billion a year rate, a carryover of this size is held to be wholly manageable, according to Mr. Livingston.

Included in the total is \$6 billion in disposable government-owned plant, \$4 billion in Army-Navy merchantable stores, \$1 billion in government stockpiles of scarce materials, and \$3 billion in manufacturers' inventories. Merchant ships, food, and military establishments are not included.

"The reconverters must make ready for and get the government's \$90 billion out of the market smoothly; second, they must leave the peacetime economy in such shape as to provide reasonably full employment; it must

be a \$175 billion a year affair," Mr. Livingston pointed out.

The difficulties facing the administrators are particularly acute because of competition between rival companies for postwar business, the Public Affairs pamphlet states.

While fairness would seem to make it necessary to start competitors on an equal footing in resuming civilian production, Mr. Livingston suggests that this may not always be wise or possible. He warns that "the start-up-all-at-once plan would fasten on the country the competitive relationships which prevailed before the war. This means keeping newcomers out . . . and actually would penalize those companies which have done the best war jobs."

### WPB Eases Rulings On Steel for Galvanized Ware

#### Washington

• • • Amending L-30-a, WPB has permitted increased use of iron and steel to make galvanized ware for civilians, removed restrictions on types of iron and steel that may be used, and liberalized restrictions on size and gage. Simultaneously coal hods and scuttles were added to the list of permitted civilian items.

Eight classes of galvanized ware items may be made for civilians: garbage and ash cans and pails (including inserts for step-on cans); pails, buckets, and tubs; washtubs; wash boilers; storage cans for petroleum products; fire shovels; funnels; coal hods and scuttles.

**CHOO-CHOO BABIES:** Two Lilliputian Jap locomotives seem to be talking it over after capture by Yanks somewhere in the Pacific theatre. These tiny choo-choos were used by the Nips to transport sugar from nearby plantations.



## Excess Materials Holders Permitted To Use Them Under New WPB Procedure

### Washington

• • • WPB has announced that procedure has been established under which a person who has excess materials or products on hand may obtain permission to use such materials and products himself, rather than sell them under the procedures for special sales.

The two phase procedure applies, 1—to controlled materials and Class A products and 2—to other materials and products. Rules governing controlled materials and Class A products are set forth in Direction 52 to CMP Regulation 1, while those governing other materials and products are contained in Direction 4 to Priorities Regulation 1.

Persons who have controlled materials or Class A products which they obtained through the use of an allotment or other materials or products which they obtained through the use of preference ratings, may apply to their nearest WPB field office for permission to use such materials for other purposes than those for which they were originally acquired, if such materials cannot be used for such original purposes, WPB pointed out. The application should be by letter, WPB added, which sets forth: a—Description of the materials which the applicant desires to use; b—How such materials were obtained; and c—Any other relevant facts which

might be required for acting on the application.

WPB will grant permission for the use of excess materials under the following circumstances:

1—If the intended use of the materials would be permitted if the same materials were acquired through a special sale under Priorities Regulation 13.

2—If the use of the materials in production in any one plant, or the labor requirements for that production, will not interfere with war production in that plant or in any other plant located in the same area.

Both Direction 52 to CMP Regulation 1 and Direction 4 to Priorities Regulation 1 point out that authorizations which may be granted under their terms will not be exceptions to the provisions of any E, L or M order or any direction issued under any such order.

## Ryerson Issues Warehouse Lists

### Chicago

• • • As significant a harbinger as the first robin of spring, a 1944-45 catalog has been issued by Joseph T. Ryerson & Son, Inc. Salesmen for steel warehouses in this district once again are preening their prospect books, singing a song of fairly complete stocks and actively soliciting customers' attention.

Typically, the Ryerson catalog states "Although steel is still a critical war material with distribution controlled by WPB regulations, Ryerson's stocks have been replenished to a point closely approaching normal inventory. . . . You may again send us your orders with confidence that they will be filled promptly.

"As steel production increases and war requirements in some lines decrease, there will be a tendency to

relax some government regulations which will permit production of limited quantities of much needed civilian commodities.

"Available steel for immediate stock shipment is and will be important to you in this conversion period. Retooling requirements and tonnage allowed to start production are important to you to obtain the benefit possible through speedy conversion from war time requirements to civilian necessity."

The latter paragraph summarizes the selling pattern adopted by the warehouses in calling on producers of war materiel whose swollen business has been diverted to the mills. There is general enthusiasm in the trade that the reconversion period will be one of heavy warehouse sales activity, just as were the months when the war machine was shifting from low to high gear. Other than showing the scars of war in simplification and substitutions, the Ryerson catalog poses a question for the future in the listing of sizes discontinued by WPB orders. Some of these items still are shown as remaining in stock, but only the end of the war will tell how many slow movers have been banished for good from warehouse stocks.

Currently, the warehouses are reflecting the critical mill situation on flat rolled products. Demand for plates, particularly, is heavy with stocks of most sizes badly depleted. Galvanized sheets represent another item which may soon be hard to purchase through warehouse channels, because of directives issued to some of the larger producers which would shift a greater proportion of this item to direct military use. Farm equipment builders, however, report that substitution of black plate is being made in that industry in order to maintain production.

## Alloy Steel Output Declines

### New York

• • • Production of alloy steels during May totaled 931,381 tons, about 12 per cent of total steel production during that month, according to the

American Iron and Steel Institute. Open hearth furnaces produced 610,370 tons of alloy steel in May. The remaining 321,011 tons of alloy steel production came from electric furnaces.

Production of Alloy Steels

Month	Produced in Open Hearth, Net Tons	Produced in Electric Furnaces, Net Tons	Total Alloy Steel Produced, Net Tons		Per Cent of Total Steel Output	
			1944	1943	1944	1943
January . . . . .	585,744	333,273	919,017	1,248,568	12	16.8
February . . . . .	584,167	320,964	905,131	1,168,592	13	17
March . . . . .	626,607	325,680	952,287	1,283,709	12	17
April . . . . .	581,005	308,046	889,051	1,214,965	12	16.5
May . . . . .	610,370	321,011	931,381	1,217,563	12	16



# A Blast Furnace Is Born in Mexico

## Monclova, Mexico

• • • As Father Ramon Blanco, padre of the little parish here in the Mexican hinterlands, offered an invocation before a gathering of American and Mexican steel specialists, a new blast furnace, Lupe, firstborn of the giant Altos Hornes de Mexico Co., went into operation on June 2.

American industrial engineers, blinking under the hot sun during the ceremony celebrating the event, heard Señor H. R. Pape, managing director of Altos, tell the history of the small, model steel plant and of how thousands of workers struggled through the difficult operation of assembling and reconditioning used materials, machinery and equipment imported from the United States, and finally fashioned it into a modern steel mill.

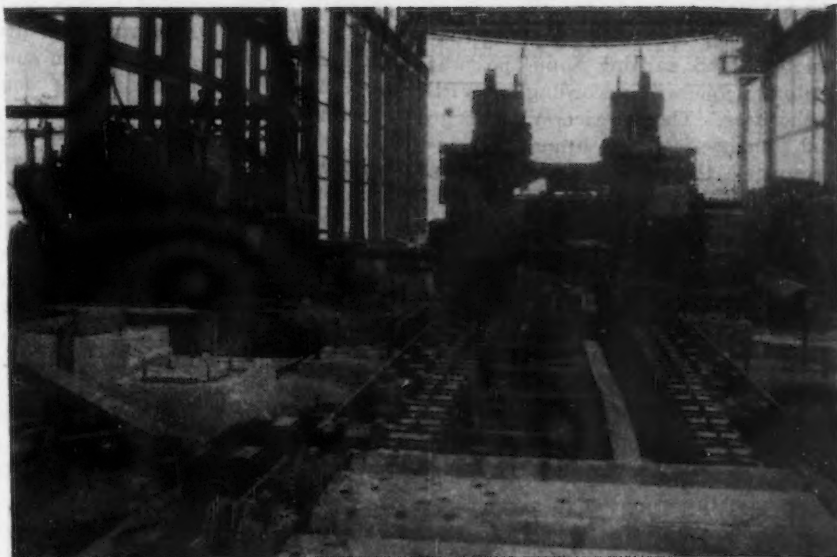
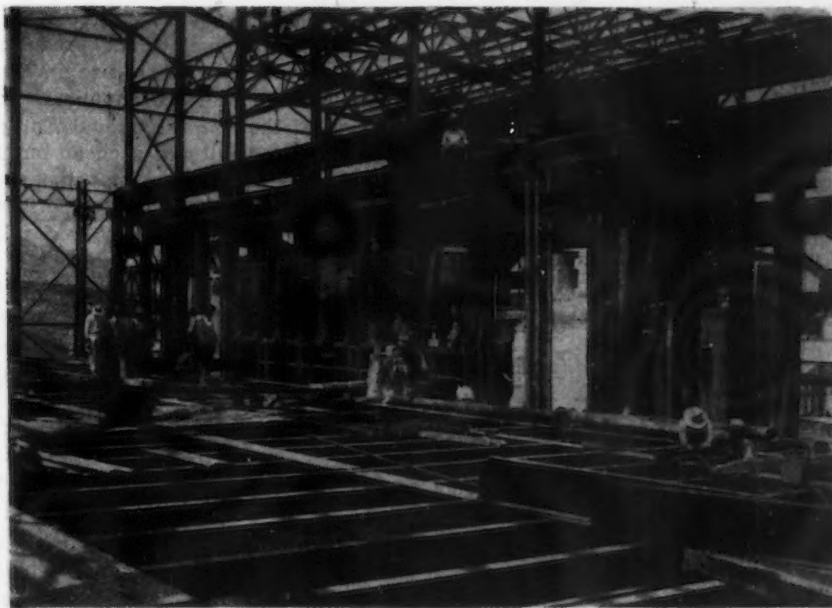
What Mr. Pape called "the first stone in the statue we are building to Mexican-American united effort" was conceived more than two years ago when Mexico realized the need for a modern steel plant in which her raw materials could be made into vital steel products.

From the beginning, the enterprise met the approval of Washington authorities who agreed to give such materials, money and support as might be spared under the trying conditions of war. The Monclova properties of Altos were selected for the site and shortly the Hetz Construction Co. of Warren, Ohio, began dismantling stoves and blast furnaces in St. Louis which would eventually go into the fine new garment of the lady, Lupe.

Trouble was not long in coming. As one sweating engineer said during the early days of the project "the settling of the West would be a pleasure compared to installing this used equipment at Monclova." However, Day & Zimmerman Co. of Philadelphia proceeded with the job of engineering the first installations and today the first difficult phase of the operation is over.

Two years ago only a hope, today it is the expectation of Altos that all remaining departments of the mill will be in operation within 10 months.

The principal products of the steel



**LUPE OF MONCLOVA:** The exclusive photographs above show the completed steel blast furnace, Lupe, in Monclova, Mexico. At the top, workmen enter the open hearth charging floor. Machinery is shown installed in the hot mill building (center) and directly above, are shown the cast iron pipe plant, boiler room and the blast furnace. Lupe was under construction more than two years.

mill will be pig iron, centrifugally-spun cast iron pipe, hot and cold rolled plates and sheets, universal bars, sheet bars, strip and tinplate. Because it was necessary to erect structural fabricating shops and boiler shops for the construction of the plant, Altos is presently equipped to undertake structural fabrication, tank, sugar mill equipment and sheet iron pipe and stack fabrication in which it proposes to utilize its own sheet and plate.

As originally conceived, AHMSA was to be a small plant producing tinplate which would secure its raw products from foreign suppliers. The advent of the war throughout Europe made the necessity of such an enterprise even more acute, but the possibility of its realization became more difficult since neither raw materials nor machinery were available.

However, "the construction program that we have partially com-

pleted here in Monclova today is entirely in excess of the original idea and represents a bold effort on the part of the founders, the bankers, the consultants, the engineers and designers and the operators to make a self-sustaining model steel plant in Mexico which will lead the way in the great industrial future that Mexico has before her, Mr. Pape told the small audience as workmen lit the fires under Lupe.

## Forge and Foundry Scheduling Lightens Manpower Deficiency Burden

### Cleveland

• • • Self scheduling of forge shops and foundries here is lightening the burden of the manpower deficiency in these industries, reducing the amount of expediting necessary by prime contractors, and earning some postwar customer goodwill, according to WPB authorities. The district WPB forge and foundry facilities branch has inaugurated the scheduling plan on a suggestion basis.

Some of the production difficulties of the forge shops and foundries arose from the lack of production scheduling which in some cases was lack of method in the business. While scheduling is required by CMP Reg. No. 1 for the forge shops and Priorities Reg. No. 1 for the gray iron and malleable

foundries, it was found on investigation that some of both types of concerns were taking orders indiscriminately and making delivery whenever possible. This, coupled with a manpower shortage which strangled production, has been responsible in some cases for shortages of urgent components needed by prime contractors, and has in some respects been partially responsible for the lag in the heavy truck program and engines for landing craft.

The same lack of method in production planning was found to be causing these industries to be haunted by expeditors who often upset production schedules further by seeking favors and causing customer ill-will.

The WPB has installed a self im-

posed scheduling system in many of these plants in order to get first things produced first. This is being accomplished on a small scale, but it is hoped that the idea will take hold and aid many of these producers.

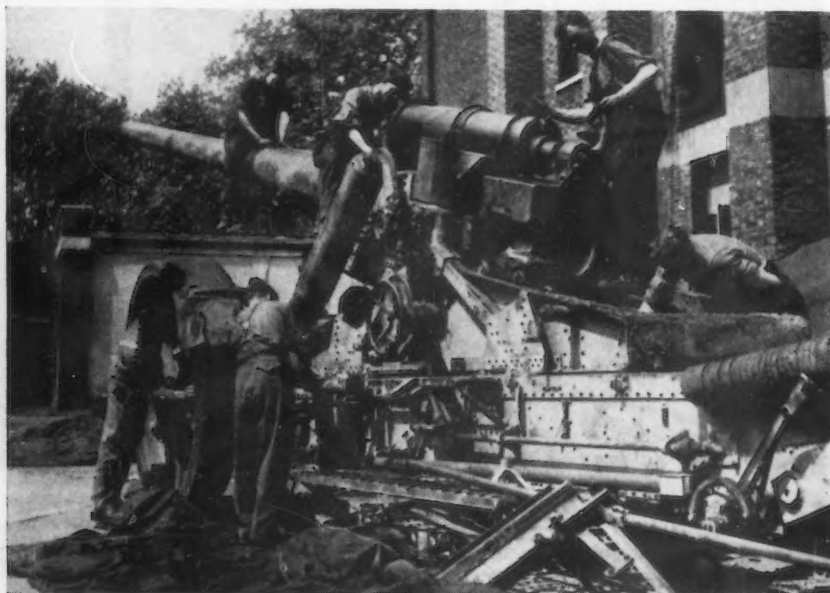
The idea behind the WPB scheduling plan is old to most war industries but new in many cases to the forge shops and foundries. The forge shops are required as producers of A products to schedule only that which can be produced from month to month. When close records of incoming orders were not kept, it was impossible to adhere to this policy. The WPB is now asking forge shops not already following this plan to do so.

The gray iron and malleable foundries, as makers of B products, are required by Priorities Reg. No. 1 to fill all orders in the sequence of their rating and priority of date. This requirement, apparently has not been very closely followed, but the new WPB plan is recommending it without compulsion.

Once scheduling boards or scheduling systems are established in these plants, testimonials from numerous facilities here indicate that production is being upped from 15 to 20 per cent in many cases, often with less manpower than formerly required. Delivery dates are being met or the customer is satisfied that every effort to meet the promise is being made. Prime contractor's expediting is falling to a new low since deliveries are being scheduled on a mutually satisfactory basis. Inventories are being reduced through better flow-planning and production generally is getting on a more businesslike basis wherever the system is adopted fully.

The question arises as to whether more complete Washington scheduling of these facilities might not have accomplished these same results on a national basis long ago. The answer, of course, comes back that the regulations requiring such planning are in effect, but the results have not heretofore been accomplished.

**ONCE-OVER LIGHTLY:** *Tommies spruce up a captured 25-ton Nazi gun which has just arrived in London from Tripoli. The imposing German heavy gun will be placed on exhibition in London. It is one of several shipped to England from other fronts.*





## No Civilian Reconversion Sighted Despite Curtailment of Aluminum Output

By THOMAS E. LLOYD,  
Pittsburgh Regional Editor

### Pittsburgh

• • • The aluminum picture, in so far as supply is concerned, has been easing for sometime; and only recently the WPB announced that there would be some aluminum for civilian consumption. However, the announcement that there would be aluminum for civilians does not necessarily make it so, because all such aluminum that is used in the manufacture of civilian items must be further processed in what are now critical war plants and manpower-tight plants.

The fact that the government aluminum expansion program, set for something in the neighborhood of 2¼ billion pounds annually, was exceeded by a substantial amount, and the fact that requirements were not as high or prolonged as originally expected, has thrown considerable of this capacity into inactivity. The largest of the DPC owned — Alcoa operated plants in the Queens, N. Y., and other lines both in the East and South, have been shut down, and this is evidence of the abundance of this light metal. The choice of specific pot lines for shutdown, especially in the East, has been governed by the fact that these Eastern lines are operated by steam rather than hydroelectric power and require quite substantial quantities of scarce coal.

The abundance of aluminum has made it necessary for the government, through the WPB, to make some provision for these growing supplies. Hence, the easing of restrictions on civilian consumption and plant shutdowns. However, until such time as there is sufficient manpower and there are plants not too busily engaged in war production, there can be little in the way of civilian products manufactured. Furthermore, in such products as washing machines, ironers, etc., where aluminum is only one of a variety of components that make up the total, there is little likelihood that other parts such as small motors, bearings, copper wiring, and such will be available in sufficient quantities to permit civilian production.

One aluminum disposal plan by I. W. Wilson, vice-president of the

Aluminum Co. of America, has been proposed and favored by the aluminum people. Mr. Wilson's suggestion calls for a "chinking in" program that would permit aluminum producers to produce standard items for sale to manufacturers. An example of this might be the production of aluminum disks for sale to potential kitchen utensil manufacturers. This material would be stocked at the manufacturer's plant until such time as the plant is not too busy on war production to handle kitchen utensil manufacture. This might be between the time a war contract is terminated and the time a new contract is obtained. Such a procedure, it is said, would serve a twofold purpose: First, it would help get civilian supplies on the market quicker; and second, it would tend to stabilize labor forces that might otherwise be laid off because of the fact the plant has no immediate work. In regard to the latter, it has been shown many times that when labor forces are laid off it is practically impossible to retrieve them. Thus, the manufacturer's experienced help could be kept at work and not permanently lost through a layoff.

Just how much aluminum is being produced at the present time is rather difficult to determine; but of the approximately 70 pot lines in the coun-

try, there must be at least 15 of them down.

Alcoa says that they now could supply 50 million pounds of aluminum a year for civilian use without causing "a shadow of interference" on necessary war production.

The forces that were used in operating these now-down-lines are, to a great extent, dissipated into other fields. When the Queens plant was closed, a considerable proportion of its manpower was air-expressed to Vancouver, Wash., to operate another of the Aluminum Co.'s plants. One line in the West has been closed because of the lack of manpower.

The so called "chinking in" plan, while favored by the aluminum industry, might well cause considerable dissatisfaction and consternation among producers of other metals. The immediate objection that could arise from the inauguration of such a plan is that, "aluminum is being given the jump on other metals in postwar reconversion, and will cut into the markets of these other metals before producers of such metals have a chance to defend themselves." This same type of reasoning was condoned by automobile builders at a meeting with the WPB some weeks ago in Washington. At that time, auto builders objected to the WPB permitting any one producer to build civilian cars, because such a builder, regardless of who it would be, would be given a jump on the others in reconversion to postwar production.

As in all postwar production plans and plans for reconversion, there is now too little known about what can be done and too much depends upon the time element of the war in Europe. There can be no doubt that after the

**GETTING AWAY FAST:** When a 100 ton concrete counterweight at the top of this drawbridge over the river at Mobile, Ala., broke loose, it took the most direct route down through the floor. Here's the way the floor looked after the weight fell through.



war in Europe is brought to a successful close, there will be a rather large scale reconversion in this country to the production of civilian materials and civilian goods. However, no industry, or group of industries, would like to see a competitive industry get the jump on such reconversion. While this is understandable, it is also shortsighted. The pentup demand for civilian commodities in this country is growing daily. Any relief is a help. As to the intrusion of one particular commodity into the markets of another, this is a possibility, but a minor one.

All materials have certain specific uses to which they can be put, in which they are better by far than any other material. In the long run, materials will be used for those things for which they are best suited. However, there is a certain small percentage of applications of materials that might be called borderline applications. In these applications, two or more materials might be equally well suited. These applications are unquestionably limited in number and in the amount of material required; and it is for these applications that competition, among materials, will be very strong.

In other words, the total requirements of materials will force those materials to a very specific level. As new products come into the field, all materials will be examined closely to see what is best suited for a specific product or component of a product. When this has been determined, the requirements for that material for a given product will be stable and quite predictable.

## Drive Against Finland Is Blow At Small Nazi Supply of Ferroalloys

### Washington

• • • Issued as a footnote to the President's announcement of June 13 regarding Germany's dwindling supply of ferroalloys, Leo T. Crowley, Foreign Economic Administrator, said that the Russian drive against Finland strikes a new blow at Germany's declining supply of these strategic materials. Finland, Mr. Crowley said, has been contributing more than half of the Nazi supply of nickel and cobalt and a fourth of its supply of molybdenum. Germany's dependence upon its ally for the first two of these metals was said to have been made all the greater as a result of new shortages of manganese and chrome for which nickel and molybdenum could be substituted to a certain extent in the production of alloy steel.

Mr. Crowley pointed out that the Germans lost the vital sources of two-thirds of their manganese supply when the Russians recaptured Nikopol. The Nazi supply of chromium, he

stated, was cut almost 30 per cent by the recent Turkish embargo on the export of this material.

"Aside from her general ferroalloy position, Germany must have tungsten or molybdenum for the production of tool steels," Mr. Crowley continued. "Tungsten is so important in the manufacture of tool steel and of projectile cores that the Germans have tried to smuggle in small supplies from the Far East by U-boat. Now that Portugal has entirely suspended its shipments of tungsten to Germany, and Spain has curtailed its shipments of tungsten, the significance of Scandinavian molybdenum has greatly increased.

"Thus it becomes clear that unless Germany can protect her Finnish sources of vital ferroalloy supply, now directly threatened, she faces new restrictions on her production of the tanks, guns, planes and other implements of war that these metals make possible."

## Urges Aid to Postwar Programs

### New York

• • • Robert T. Brooks, executive vice president of the American Institute of Steel Construction, recently urged members of the structural steel fabricating industry to help architects

and engineers expedite the work of postwar construction programs, which are "important to future employment in this country."

"The War Production Board has already given industry the signal to lay the ground work for a swift return to peacetime production," Brooks said. "This is a significant reminder that just as soon as war critical materials are released, construction work will get under way and into the hands of contractors.

"While actual construction is not expected to proceed until after the war, postwar construction is a national problem, and the fact that all of these many projects are now in the planning stage imposes a big task on the members of the steel fabricating industry to help America recover from the war years. It is important to future employment in this country that we follow through on postwar plans."

Brooks said that a group of institute engineers had been brought to New York from outlying districts in order to assist in the huge New York postwar construction program, architectural contracts for which are now being awarded.

**OVER AND ABOVE:** At the Birmingham General Hospital, Van Nuys, Cal., convalescing soldiers assemble inspection plates for airplanes being built by Northrop Aircraft Corp. Men are paid same wages as civilians performing the same tasks in the factory.





## Cooper-Bessemer Inaugurates Vocational Training for Veterans

### Mt. Vernon, Ohio

• • • Preparing vocationally handicapped veterans for postwar jobs passed from the plan stage into action recently as the Cooper-Bessemer Corp. inaugurated an apprentice training program in cooperation with the Rehabilitation Division of the Veterans Administration.

A group of veterans has already started the course at the Ohio plant, according to Steven Hurtuk, chief of the training division at the U. S. Veterans Administration Hospital at Brecksville, Ohio, and it is said that the company will start additional apprentice groups in the near future as discharged soldiers with accredited aptitudes become available.

This four-year apprenticeship course calls for 8232 hr. of shop work and 768 hr. of related class room instruction, under the supervision of capable instructors who will devote their full time to this work. Those completing the course will receive from the state a "certificate of completion" to give evidence that they qualify as full-fledged machinists. It is also customary for Cooper-Bessemer to present each man with a \$100 bonus and to give him a job at journeyman's wages.

In addition to the instructors who will train the discharged veterans, the course is supervised by an apprenticeship committee consisting of three labor representatives and three management representatives assisted by the Mt. Vernon superintendent of schools as an ex officio member of the committee.

It was pointed out that a majority of the workers at machines today have learned simply to operate one kind of machine, frequently on but one kind of operation, and that the experience gained in this way cannot compare to that of a journeyman machinist when it comes to getting postwar jobs. Those who complete the course will definitely qualify as journeyman machinists.

The veterans, it was said, will receive standard apprentice pay. In addition, each man will receive from the government a monthly maintenance allowance so that his combined income will approximate that of a journeyman machinist. In this way, right from the start, each trainee, with his family, will be in a position to take his rightful place in com-

munity life and in civic affairs. As his apprenticeship pay rate advances, his allowances from the government will decrease accordingly until he becomes entirely independent as a journeyman machinist.

A vocationally handicapped veteran may be a high school boy who went into the Army without the benefit of previous job training, a man with a physical disability which prevents him from carrying on his former type of work, or a man who may have been

a laborer or in some form of work which gave him no special postwar job qualifications. Accredited veterans who apply for apprentice training are given a comprehensive aptitude test to determine the course of work in which they are most likely to succeed. It is pointed out that this program is not to be confused with the government-sponsored program for immediately placing men in semi-skilled jobs.

It is understood that labor union heads are cooperating enthusiastically in the apprentice training program, and that the company as a whole is pleased to be one of the first to take action in such an undertaking.

## WLB Sets Reconversion Precedent

### Minneapolis

• • • Possible precedent on wage differentials in plants which gradually reconvert to civilian production is contained in War Labor Board action on a case affecting the Minneapolis-Moline Power Implement Co. here. Although the company's three Minnesota plants are heavily engaged in the production of war materials, two of them also continue the manufacture of farm implements.

Much of the work is done on a piece rate basis, and the United Electrical, Radio and Machine Workers of America (CIO) claimed that the base rate

for war workers was set at 90c., while the farm equipment base remained at 85c. an hour.

The Sixth Regional War Labor Board, Chicago, directed the company and the union to negotiate the issue and if unable to agree to resort to the agreements procedure in their contract, which terminates arbitration.

"The parties shall arbitrate a representative number of individual grievances for the purpose of testing the union's claim that inequities exist," the board ordered. If unable to agree then, the results of the arbitration and negotiation may be brought back to the WLB for decision.

**PRESENTATION CEREMONY:** An exact replica of the Precisionaire gage typical of the instruments responsible for the dimensional quality of millions of gun barrels is presented to Brig. Gen. H. F. Safford at the Sheffield Corp., Dayton, Ohio. Standing around the instrument, l. to r., are Louis Polk, president of Sheffield; S. C. Allyn, president, National Cash Register Co.; E. F. Johnson, vice-president, General Motors; Brig. Gen. Safford, representing Army Chief of Ordnance; Brig. Gen. James Kirk; and E. R. Godfrey, general manager, Frigidaire division, Sheffield Corp.



## Carnegie Illinois Iron Ore Thawing Furnace Handles Carloads

### Pittsburgh

• • • An ore car thawing plant constructed by Rust Furnace Co., Pittsburgh, for Carnegie-Illinois Steel Corp., successfully completed its test period during the latter part of the past winter, according to a report made public recently. The plant is to overcome the winter-time condition in which ore from the Lakes becomes soaked with moisture and freezes in the cars so that it will not run out when dumped. Erected and put in operation in the latter part of the winter, this plant consists of a building with a capacity of two 90-ton ore cars. Housed on a second floor are combustion units for producing hot gas for recirculation and application against the cars.

The arrangement includes thaw chamber, where the cars stand; two double chamber furnaces with rated capacity of 10,000,000 b.t.u. per hr. each; two fuel-oil-fired burners, combustion air fan, fuel supply line, steam supply line for fuel atomizing, and motor-driven air recirculating fan, together with the necessary ducts, passages and controls.

The thawing operation consists of circulating air and gases from the combustion chamber through a closed air circuit, comprising the thaw chamber, furnace, fan and interconnecting ducts, the air being alternately heated and cooled in its passage.

In operation, two loaded cars are positioned in the thaw chamber by locomotives. After the locomotive withdraws, its operator, who has complete charge of the thaw chamber electric control, automatically sets derauling devices on the rails, and also a red light signal, blocking traffic in and out of the chamber. The impulse from the same control sets up a circuit to close the doors.

The closing of the doors puts in operation the furnaces and air recirculating fans. An adjustable cycle timer regulates the thawing cycle in two periods gaged by the operator according to the hardness of freeze. The periods are approximately: 1—10 min. flash heating in excess of 500 deg. F., 2—cutback to between 200 and 250 deg. F. for five to 10 min. of base heating or soaking. At the end of this cycle, the operator opens the doors, this electrically-controlled action causing the fuel shut-off valve to close and stop the air recirculating



**ORE THAWING:** While the thermometer hovered around 95 deg. F. in Pittsburgh, Carnegie-Illinois and Rust Furnace Co. announced that tests during the past winter on a new ore car thawing unit were successful.

fan. A pilot flame is left burning to initiate the next combustion cycle.

The two thawed cars are then spotted on the car dumper platen. Here their surface-thawed ore is dumped into electrically drawn transfer cars.

The experience with this plant, although rather mild weather did not make the normally expected demands on it, was sufficient to show the plant provides an efficient solution for the problem of frozen ore cars, with savings in time and labor.

### Ore Carriers to Move 84,000,000 Tons in 1944

#### Buffalo

• • • Movement of iron ore over the Great Lakes for the 1944 season is now expected to total about 84 million tons, about equal to last season's total, according to W. J. McGarry, manager of the Ore and Coal Exchange in Cleveland, speaking before the 59th regular meeting of the Great Lakes Regional Advisory Board on June 28. This ore total is approximately the same as last year's ore movement even though the season promises to be a month longer. This apparent decline is expected to be offset by an increased movement of

grain, which would equal an additional 3½ million tons of ore.

About 60 per cent of the ore tonnage handled on the Great Lakes involves a rail movement to the mills and furnaces, and on the basis that 84,000,000 tons of ore will be transported during 1944, there will be approximately 50,400,000 tons for rail movement.

Unlike conditions in the first World War when boats were delayed for as long as 10 days awaiting cars into which to transfer the ore, there was not a single vessel delayed at Lake ports during 1943 or so far during 1944 for this reason, Mr. McGarry said. There were 46,059,334 tons of cargo and 1,395,408 tons of fuel coal dumped to vessels at ports on Lake Erie during the season of 1943. Coal movement is expected to total 54,000,000 tons this year.

The stone movement on the Great Lakes, according to Mr. McGarry, is governed to a great extent by the tonnages of ore handled. For the season of 1943 there were 17,339,675 tons of stone handled and with an anticipated ore movement for this year of approximately the same tonnage, as 1943, the stone movement will be about 17,500,000 tons.

### Decline in Fluorspar Production Expected

#### Washington

• • • Concern that labor withdrawals for the armed forces may cause a substantial decline in production of metallurgical fluorspar was expressed by H. T. Mudd, chief of the WPB Fluorspar Section. In Mr. Mudd's opinion, the domestic supply may fall short of requirements by as much as 20,000 to 30,000 tons in 1944.

The WPB official said that only in the case of serious need would any domestic deficiency be made up from imports. "Imports and government stocks will not be available to the steel industry unless the domestic industry is unable to maintain minimum inventory requirements," he said.

Regarding production of acid grade fluorspar, Mr. Mudd pointed out that industry is expecting a domestic acid production of approximately 140,000 tons, after discounting the draft.

He said that nearly all imports of acid grade fluorspar are being made available to the trade, as it is expected that the domestic industry will not be able to take care of the 1944 requirements.



## Iron and Steel Scrap Schedule Simplified and Revised by OPA

### Washington

• • • OPA on June 30 announced revision of the iron and steel scrap price schedule so as to provide the industry with one regulation giving in simplified form all applicable provisions of the schedule, together with amendments and official interpretations issued to date. Effective July 5, the regulation is titled Maximum Price Regulation 4 and supersedes Price Schedule 4. The revision dates back to April, 1941, when price control was administered by the Price Stabilization Division, the first agency set up for that purpose.

Changes made were primarily for the purpose of clarification and were incorporated in the regulation upon the recommendation of the Scrap Iron

and Steel Industry Advisory Committee and WPB. The few price changes are all minor and there is no basic change in either price levels or the method by which maximum prices are computed. The regulation has been arranged so that each section deals with one specific subject.

The four major changes are as follows:

- 1—Basing point prices are established for several grades of scrap previously priced by letter.
- 2—An adjustment is made in preparation fee differentials between scrap rails in random lengths and short rails.
- 3—Separate specifications that covered cast iron scrap of railroad origin and cast iron scrap of dealer and industrial origin have been combined so that one set of specifications covers cast iron scrap regardless of origin.
- 4—Railroad basing points have been eliminated and the basing points for steel scrap of dealer and industrial origin have been established as basing points for steel scrap of railroad origin.

## Union Demands Set at \$691 Million

### Washington

• • • Summarizing and partially supplementing the estimate presented to the WLB's "basic steel" panel in the CIO-USWA case, Richard H. Appert in a brief filed July 1 for the Steel Case Research Committee said that an increase of \$691,400,000 annually in employment costs in the steel industry would result from the granting of seven of the 14 demands made by the union. The cost to the companies now before the panel, which employs 92 per cent of the wage earners in the industry, was estimated at \$635,700,000.

The remaining seven demands, except the one respecting the check-off, Mr. Appert pointed out, would involve substantial additional cost, the amount of which it is not possible to estimate on the basis of available costs. The demands included in the estimate were those for 17c. an hour wage increase, guaranteed annual wage, increased vacations with pay, sick leave with pay, shift premiums and group insurance. Granting of the 17c. an hour wage increase, it was said, based on the number of man hours worked by wage earners in January, 1944, would cost the industry \$220,300,000. This total, Mr.

Appert said, does not take into account additional payroll costs which would result if corresponding general wage increases should be granted to salaried employees, and to employees in operations which are not included in the steel industry.

## Haswell Named President of Malleable Founders' Society

Hot Springs, Va.

• • • Anthony Haswell, president, Dayton Malleable Iron Co., Dayton, Ohio, was elected president of the Malleable Founders' Society here on June 15 at the annual meeting of the society.

Other officers elected were: K. M. Smith, president, Lancaster Malleables & Steel Corp., Lancaster, N. Y., vice-president; Haldwell S. Colby, executive vice-president, and Robert E. Belt, secretary and treasurer.

At the meeting the by-laws of the society were amended to provide for an additional office which is that of the executive vice-president. Mr. Colby, who was elected to the new position, has recently served on the War Production Board in Washington in connection with the forge and foundry program. He has had a long association with industry, his last position being that of Divisional vice-president of the Baldwin Locomotive Works at Eddystone, Pa.

## Safety Guide for Welders Prepared by Standards Group

New York

• • • "Safety in Electric and Gas Welding and Cutting Operations" is another publication in the series of American war standards developed by the American Standards Association. Its preparation was initiated by the International Acetylene Association, the American Welding Society, the National Electrical Manufacturers Association, and the Division of Labor Standards of the U. S. Department of Labor.

The 32-page booklet is designed to serve as a guide for the protection of the individual operator from injury or illness, and for the protection of property from fire or other damage arising out of improper methods in the installation, operation or maintenance of welding and cutting equipment. It covers every phase of safety applicable to all ordinary welding, cutting, brazing, lead burning, and flame-treating operations.

## Steel Strikes

Canton, Ohio

• • • As the five day strike at Timken's four plants at Canton, Ohio, came to an end Sunday, with operations gradually increasing toward full scale on Monday, two of what might be the most far reaching steel strikes since the beginning of the war were in progress at the Clairton and Homestead works of Carnegie-Illinois Steel Corp. The Clairton strike, called by 81 pilers and chippers, forced about 1200 into idleness in the structural mills and beam yards, and caused a shutdown of an open hearth shop and the partial shutdown of a blast furnace. The strike lasted two days with a

loss of about 4400 tons of steel.

The Homestead strike, starting at midnight on June 29, was still on early this week in spite of guarantees of workers to return to work. Thirty crane men in the DPC open hearth shop started the strike and by Monday morning, July 3, the steel loss was estimated at 10,000 tons. About 1000 men are idle, closing down four structural mills, the open hearth shop, the equivalent of one blast furnace, and other facilities. Crane men agreed to return to work on July 1, but failed to show up. Other workmen that appeared could not return to work because of the absence of the crane men.

## WPB Concerned About Drop In Steel Production; Solution Sought

### Washington

• • • Concerned over the drop in steel production, attributed to the critical labor supply situation, a meeting of the Iron and Steel Advisory Committee has been called by WPB for July 7, to be followed a few days later by a meeting of the Steel Labor Advisory Committee, in an attempt to find a solution to the problem.

WPB in a statement issued June 29 reported steel production was proceeding at 95.7 per cent of rated capacity as compared with 99 per cent in the middle of May.

The steel problem was discussed by the Production Executive Committee recently when anxiety was expressed because 31 open hearth furnaces were shut down for lack of labor to operate them, representing a loss of about 200,000 ingot tons a month. To this loss, WPB said, must be added several hundred thousand additional tons of monthly production that might normally be expected from facilities now in operation, but cannot at this time be counted on because today it takes double the time—about 30 days—that it formerly took to repair an open hearth furnace due to manpower shortages.

WPB Executive Vice Chairman Charles E. Wilson, told the Production Executive Committee that because of the acute manpower situation and hot weather it now looks as if the industry might fall short of meeting allotment already made for the coming three months.

At the present time finishing facilities are processing total ingot output but when furnaces now shut down are provided with the labor necessary to resume production, more workers will also have to be provided for subsequent processing in steel plants, if the added ingot tonnage is to move into manufacture for war, WPB said.

Other figures provided by the WPB Steel Division show that of the labor force of 600,000 employed at the 100 per cent operating rate required of the steel industry during the last three years, approximately 180,000 men, or roughly 30 per cent of the total employed, have been inducted into the military services. After making all possible replacements, the employment of some 50,000 women and lengthening the work week, the remaining deficit in employment in the industry stands at about 50,000 employees.

bands, 18 in. wide and 1 in. thick that are riveted around the shell of the ship. Along the original main deck, two of these bands were also riveted. The use of these bands or "stiffeners" has been recommended by the Coast Guard to afford additional strength. A special watertight bulkhead has been incorporated into the ship for addition stiffening. Further strengthening of the ship is attained by the double bulkheads. These are made up of a primary bulkhead of  $\frac{1}{4}$  and  $\frac{5}{16}$  in. steel plate and a secondary or facing bulkhead of steel sheet. This type bulkheading, known as the Martin-Parry bulkheading system, has been developed by Bethlehem for use on ships.

The ship has been divided up by the bulkheads into wards, mess quarters and living quarters. Particularly interesting is the single general ward having a capacity of 108 patients, chiefly ambulatory. Special wards have been constructed for metal cases. Many wards may be regarded as the semi-private type of ward having accommodations for four patients, others for six and 12.

An elevator carries patients from various decks to the dressing stations and operating rooms. They are two operating rooms, one of which is a sterile operating room. The ship is fireproof. By means of thermostats located in all rooms and passageways, the presence of a fire is signaled to the wheel house.

## Liberty Converted To Hospital Ship

### New York

• • • Under the command of Col. Norman L. Heminway, the U. S. Army Hospital Ship "Wisteria" left the Bethlehem Brooklyn 27th Street yard on June 30th, as a six-storied floating hospital. In the process of changeover from the Liberty ship "William Osler" of 8000 tons, there was added 4000 tons of new material, mostly steel, to attain greater strength and to insure invulnerability to storms.

The "Wisteria" which will soon join the expanding hospital ship fleet has a patient capacity of 597. Her medical staff and detail will consist of 17 medical officers, 39 nurses and 159 enlisted men who will serve as medical attendants. In addition she will carry two chaplains, and a ship's crew of 123. The "Wisteria" will be used to bring wounded and mentally incapacitated army men from the

theaters of operation to ports of embarkation in this country.

The outstanding feature in the stabilization design are the steel plate

## Lukens Celebrates 134 Years of Family Ownership

### Coatesville, Pa.

• • • This week, the Lukens Steel Co. is 134 years old. The anniversary is believed unique in that it marks not only a record of continuous iron and steel production by an uninterrupted line of family ownership and management, but also marks the founding of the city of Coatesville which occurred the same day. Lukens operates the largest rolling mill in the world, employs 6442 people, covers 350 acres of ground and has two subsidiaries.

## Correction

### Washington

• • • In THE IRON AGE of June 29, page 88, it was erroneously stated in the table showing disposition of property by federal agencies that \$9,000,000 worth had been redistributed by the War Department. The correct figure is \$99,000,000.

## COMING EVENTS

Oct. 5-7—SAE National aircraft engineering & production meeting, Los Angeles.

Oct. 5-6—AIME Electric furnace steel conference, Pittsburgh.

Oct. 10-11—Gray Iron Founders' Society, Inc., Cincinnati.

Oct. 12-14—The Electrochemical Society, Inc., Buffalo.

Oct. 16-18—AIME Fall meeting, iron and steel division, Cleveland.

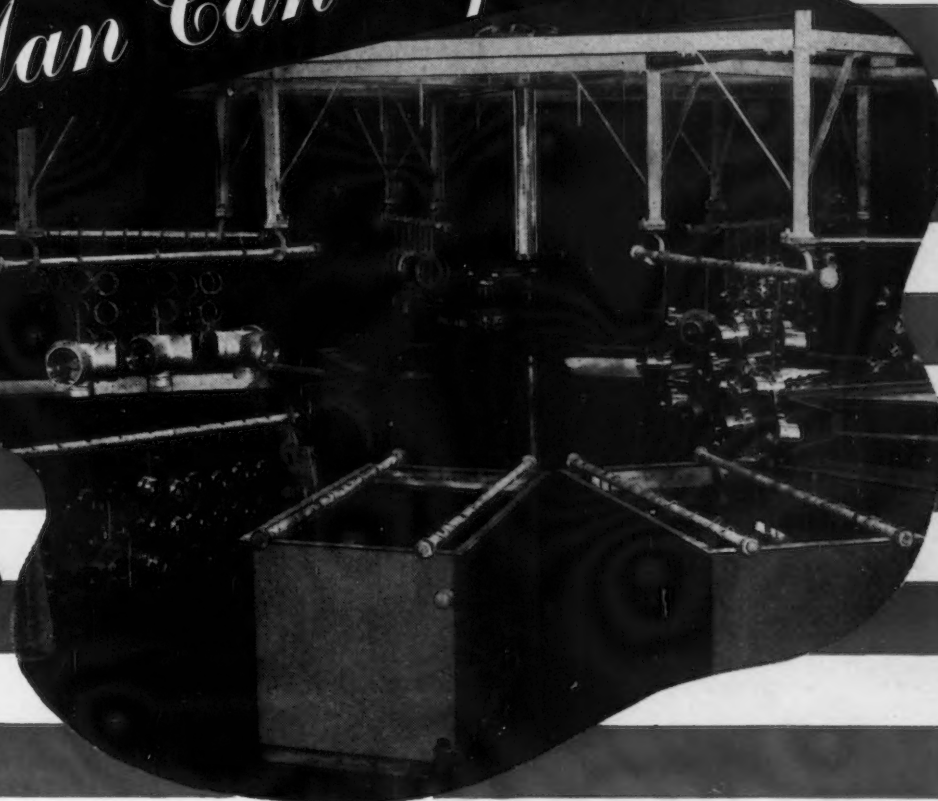
Oct. 16-20—American Society for Metals, Cleveland.

Nov. 2-3—Industrial Management Society, National Time and Motion Study Clinic, Chicago.

Dec. 4-6—SAE National air cargo meeting, Chicago.



*One Man Can Lift 3000 lbs..!*



**WITH THE NO. 3 BULLARD-DUNN AUTOMATIC STATION TYPE CONVEYOR  
AND HE CAN LIFT MUCH MORE WITH THE NO. 9 SIZE**

Here, he is cleaning aircraft propeller parts by the Bullard-Dunn Process prior to plating, but the machine is just as useful for conveying work through other sequences, such as

pickling, blackening, bonderizing, plating, and heat treating. These machines expedite production in the face of the manpower shortage and by accurately timing treatments.

**HERE ARE SOME OF THE FACTS**

- Fully automatic
- Timing controlled by adjustable timer
- Number and length of arms to suit jobs
- Machines are rugged and lift heavy loads through high lifts
- Simple hydraulic construction
- Geneva motion mechanism produces smooth indexing
- Loading and unloading can be done at one station

These machines were designed and are manufactured by The Bullard Company—known the world over for its machine tool engineering and fine workmanship.

Write at once for descriptive booklet giving full specifications.

**BULLARD-DUNN DIVISION OF THE BULLARD COMPANY  
BRIDGEPORT 2, CONNECTICUT**

**BULLARD-DUNN**  
*Conveyor*



## Parish ALUMINUM STAMPINGS



Unimpaired metal structure and strength. No creases or wrinkles. Fidelity to design. Superior finish. Multiplied production speed. Minimum metal waste. Much lower costs. These are the results of producing even the most intricate modeled shapes on the great Parish battery of regular drawing presses. Parish complete service includes collaboration in the initial design stage; production; heat treating; and X-ray inspections of stampings; assembling including welding; painting or other finishing.



Use Parish facilities in part or their entirety for shapes and parts of aluminum or other metals.

**MODERN DESIGN AT LOW COST**

# Parish Pressed Steel Co.

Subsidiary of SPICER MFG. CORP., READING, PA.

Western Representative: F. Somers Peterson, 57 California St., San Francisco, Calif.

## Hamaker Sees Little To Fear from Light Metals and Plastic

**New York**

• • • The steel industry has little to fear from the expanded productive facilities in light metals and plastic on its postwar markets, L. S. Hamaker, assistant general manager of sales for Republic Steel Co., declared last week before a meeting of the Sales Executives Club.



L. S. Hamaker

Mr. Hamaker explained that "it is difficult to generalize about plastics" and that the molding difficulties and other characteristics would confine such materials to a scope which would not trouble the steel market. The market for plastics, he declared, "looks like a gadget market to us and steel never lived off gadgets."

According to the Republic Steel executive, the problem of reconversion is being greatly overstressed. He challenged his audience to name two major industries, in addition to the automotive industry which cannot be in production upon sixty days' notice.

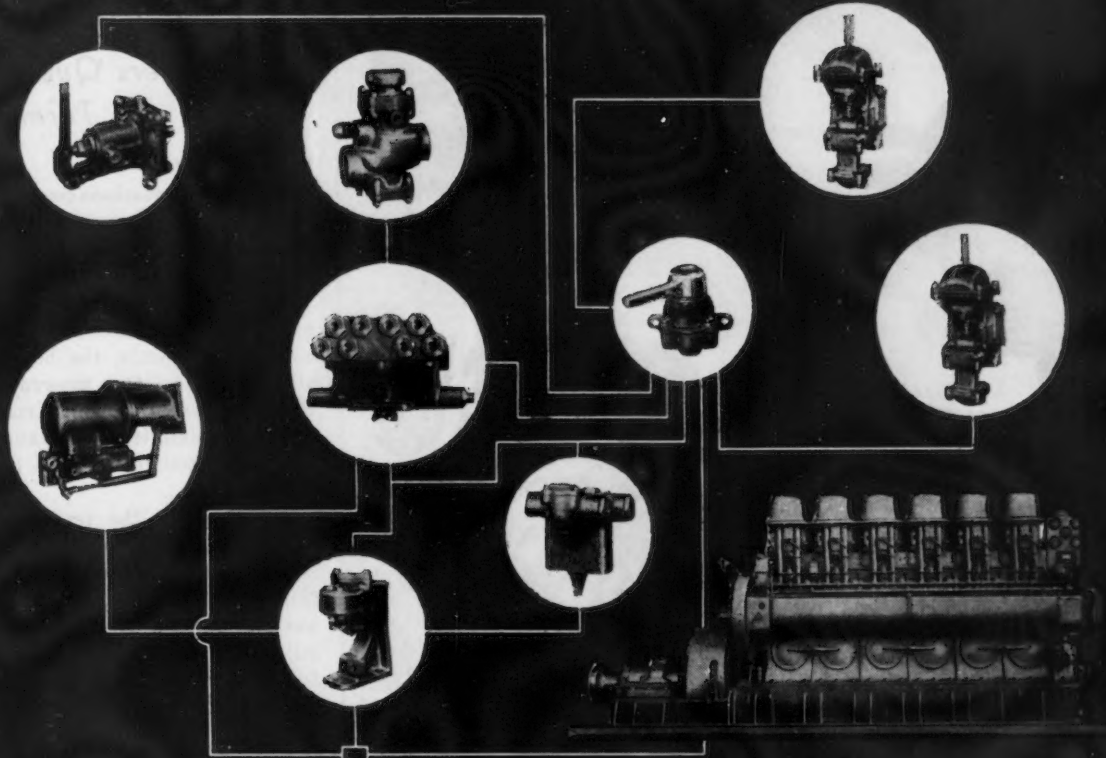
Because the aircraft and shipbuilding industries have special reconversion problems, however, Mr. Hamaker made exceptions of these two industries and predicted that their immediate postwar future looked "sad." It was pointed out that in the aircraft industry, the problem was how to shrink fast enough to keep from running out of money after orders stopped coming in.

Specially alloyed steels are already displacing aluminum in aircraft parts where the tensile strength of aluminum is insufficient and he said, quoting an engineer "We'll have steel airplanes long before we have aluminum automobiles."

"We're optimistic on the postwar outlook for steel," Mr. Hamaker said, "and we have found little disturbances in steel consuming industries. There will be a great demand for automobiles, residential housing and in the deferred railroad maintenance program. Road-building programs and building by farmers will also provide large outlets."



GIVE W·A·B CONTROLS A PLACE IN YOUR PLANNING



## Here are the W·A·B devices that do the work (and some of the thinking) in engine maneuvering

The jobs that W·A·B Controls are already doing give the best picture of their possibilities . . . and of how easily they may be designed into *your* planning.

Consider this giant reversing diesel, for instance. Adding the few small W·A·B devices pictured completely revolutionized the engine control.

All engine operations are governed by movement of a small handle. Movement of the handle in the operating quadrant produces sequential movement of the actuating mechanism.

Moving the handle through the neutral position to the opposite quadrant successively cuts off the fuel; shifts the cam shaft; admits starting air (which brakes the engine, if it has not completely stopped rotating); starts the engine in the reverse direction, and—finally—opens the fuel valve. It is impossible for the operator to alter this sequence and damage the engine. Related functions of the driven machinery can

also be tied into the control system, and safety interlocks easily incorporated.

If you are thinking about improvements in your product or your production equipment, where a remote control problem is involved, you'll find it profitable to give W·A·B Controls a place in your planning.

Westinghouse Air Brake Company



INDUSTRIAL DIVISION

General Offices: Wilmerding, Pa.

75 Years of Pneumatic Control Experience

**W·A·B**



1869



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Pneumatic . . . Pneumatic-Electric . . . Pneumatic-Hydraulic

**remote control systems**



## ... the dependable protection for goods in transit!

**I**N STEAMING JUNGLE and frigid arctic areas, war supplies protected by FIBREEN are arriving in usable condition despite direct exposure to the elements.

The weatherproof, tear-resistant, scuff-proof qualities that made FIBREEN the preferred protection for peacetime goods in transit are the very reasons why it is now an essential war need. When victory is won, FIBREEN will again be available for general use.

## Cut Costs and Simplify Your Postwar Shipping ... Our Knowledge Is At Your Service!

Shipping methods in almost every industry have been improved, and costs reduced, by the use of FIBREEN. For over 24 years The SISALKRAFT Company has pioneered in the development and production of fibre-reinforced, waterproof wrapping materials.

Methods of using FIBREEN, developed by SISALKRAFT research engineers, have improved shipping methods with a resultant saving in wrapping and handling costs.

In your postwar planning you may benefit from our 24 years experience in the uses of FIBREEN and other SISALKRAFT products — to protect your products from damage in transit — and to cut costs.

SISALKRAFT leadership is the result of the unmatched performance of its products and a research and engineering service that is constantly perfecting new, low-cost wrapping materials and methods for industry.

Let SISALKRAFT help solve your wrapping and shipping problems. Our knowledge is at your service.



Manufacturers of SISALKRAFT, FIBREEN, SISAL-X, SISALTAPE AND COPPER-ARMORED SISALKRAFT

## Contractor's Booklet Answers Questions On Terminations

### Washington

• • • Major questions confronting war contractors are answered in a new booklet, "The Contractors Guide," the War Department announced recently.

Written in non-technical language and graphically illustrated to emphasize salient points, the booklet is another step in the program of the Readjustment Division, Army Service Forces, to simplify action and promote speedier settlements of terminated contracts.

The work is the result of months of field experience by the procurement services, and of studies and suggestions from industry and national trade associations as reported to the Readjustment Division, which has staff function in making policies to handle the increasing load of termination settlements.

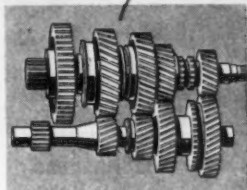
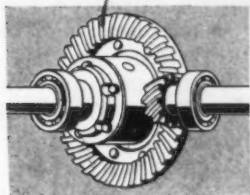
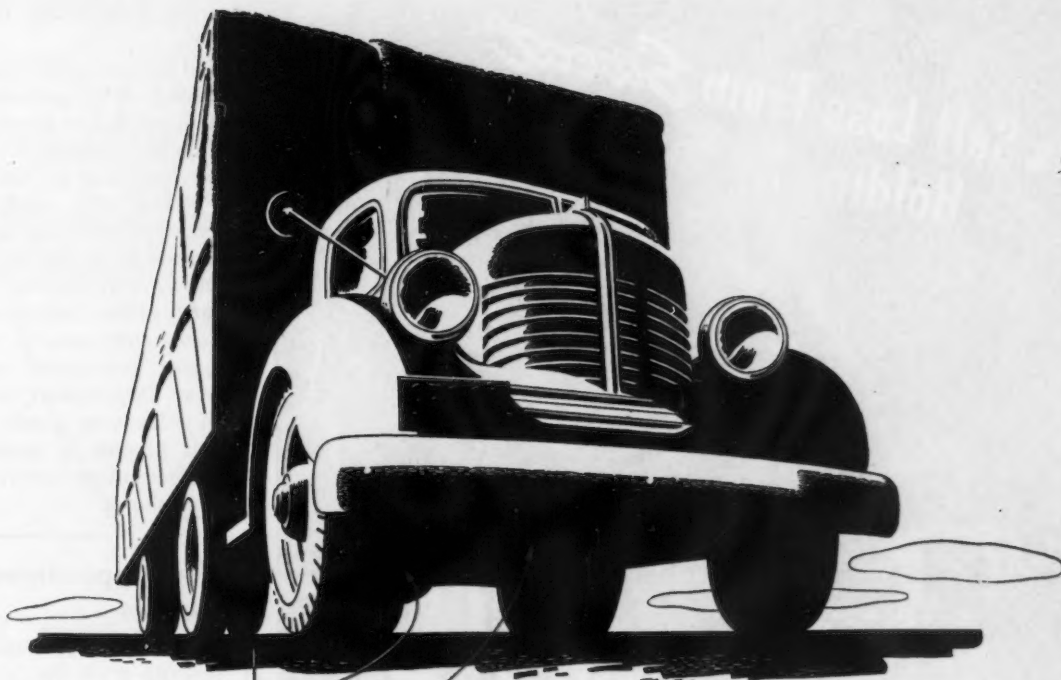
Contracts are being terminated now by the field officers of the procurement services in order to clear the way for manufacture of new and better weapons coming from the drawing boards and laboratories, and from tests at the fighting fronts. "The Contractors Guide" is designed to aid industry by giving the busy executive a quick preview of the job to be done. This publication, for both prime and subcontractors, will be available about July 1 at the many procurement offices of the War Department throughout the country.

Written for contractors holding fixed-price supply contracts with the War Department, the publication sets forth the chronological actions in a termination settlement. The guide emphasizes preparation for termination by listing steps the contractor may take before any of his contracts has been terminated.

Based on the Army's procedures in Procurement Regulation No. 15, the booklet has three main sections. The first gives the ABC of terminations. The second suggests things the contractor can do in his shop, with the government, and with his suppliers and subcontractors. The last contains facsimiles of the new uniform termination forms.

On these simplified forms, obtainable from field procurement offices, the contractor submits the facts about his inventory, and costs, charges and proposed profit. It was emphasized that the new guide deals only with that part of the action required of the





## Follansbee pre-forging for sound alloy steels

Wherever severe conditions put steels to the test—whether it be in transmission gears in heavy trucks and bulldozers, or in the landing struts of giant aircraft—Follansbee Pre-Forging demonstrates its value.

Follansbee, though it furnishes only the basic steel—from blooms to strip—brings the advantages of forging into the very first operation after the ingot is poured. Pre-Forging is the exclusive process which

presses ingots into blooms and billets . . . imparts a uniform density and grain structure that can be relied upon, shipment after shipment.

For forgings—or for products requiring sheets and strip—Follansbee Pre-Forging and the skill of its compact organization assure the sound alloy steels that respond properly to your heat treating and working quality requirements.

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POLISHED BLUE SHEETS • ELECTRICAL SHEETS & STRIP • SEAMLESS TERNE ROLL ROOFING

# Is Salt Loss From Sweat Holding Up Your Production?

## Stop it for less than 1c a man per week

When workers sweat their systems lose essential salt . . . And salt *is* essential. It gives tone to the blood. It keeps body fluids in equilibrium. It helps maintain proper body temperatures.

Loss of this salt through sweating dehydrates the body . . . thickens the blood . . . causes Heat-Fag. The resulting fatigue and inalertness make production sag and accidents rise.

To drink water alone is not the cure. It only dilutes the body fluids. The result is heat cramps . . . and more loss of production.

The real answer, recommended by industrial doctors and endorsed by America's greatest corporations, is to place salt tablets at every drinking fountain. Then, workers who sweat can get the salt they need when they take a drink of water. Morton's Salt Tablets are the easy, simple, sanitary way to replace the body salt sweated out. And the cost is less than 1 cent a man per week.



### MORTON'S DISPENSERS

They deliver salt tablets, one at a time, quickly, cleanly—no waste. Sanitary, easily filled, durable.

800 Tablet size . . . \$3.25

Order from your distributor or directly from this advertisement . . . Write for free folder.



MORTON SALT COMPANY, Chicago 4, Ill.

### This Is What Happens When Sweating Robs the Body of Salt . . .



### QUICK DISSOLVING (Less than 30 Seconds)

This is how a Morton's Salt Tablet looks when magnified. See how soft and porous it is inside. When swallowed with a drink of water, it dissolves in less than 30 seconds.

Case of 9000, 10-grain salt tablets . . . \$2.60  
Salt-Dextrose tablets, case of 9000 . . . \$3.15

contractor, and omits all action required of the government, thus giving the contractor a concise picture of his role in obtaining a fast, fair and final settlement of his terminated contracts.

Many war contractors with terminated contracts are not submitting claims promptly to procurement offices. Pointing out that the government cannot settle a contract until the contractor puts in his statement of costs, inventories and charges, the War Department said that the new "Contractors Guide" should quicken this process by promoting knowledge of the contractor's responsibilities and procedures.

### New Appointments by WPB

Washington

• • • Philip D. Wilson has been appointed WPB vice-chairman for Metals and Minerals. Arthur H. Bunker, who has been serving as vice-chairman for Metals and Minerals and who recently was appointed vice-chairman of the Production Executive Committee and director of the newly-formed PEC staff, also has been appointed deputy executive vice-chairman of WPB. Mr. Wilson, who has been serving as director of the Aluminum and Magnesium Division, succeeds Mr. Bunker as metals and minerals vice-chairman.

**INGENUITY:** Three Navy chief petty officers operate this home-made windmill washing machine they rigged up at the Naval Air Base on Kaneohe, Hawaii. The boys invented the machine after they got tired of doing their clothes by hand.





# TRY "ENGINEERED" LOCKING!

Illustration showing Shakeproof Type 45 Dome Lock Washer. Shakeproof Dome Lock Washers with plain periphery are particularly advantageous when used to span oversize or elongated clearance holds. Pressure is directed to the outer rim, distributing the load over a large area.

## SHAKEPROOF LOCK WASHERS



**TYPE 11 EXTERNAL TOOTH**  
For U. S. Standard Hex Nuts;  
Square Nuts; Hex Washer Head  
Screws; Binding Head Screws;  
Truss Head Screws.



**TYPE 12 INTERNAL TOOTH**  
For S.A.E. Hexagon Nuts; Round  
Head Screws; Fillister Head  
Screws; Hexagon Head Screws.



**TYPE 15  
COUNTERSUNK TOOTH**  
For Flat Head Screws; Oval  
Head Screws.



**TYPE 40  
EXTERNAL-INTERNAL TOOTH**  
For Electrical Bonding Applications.

**WRITE FOR FREE TEST KIT No. 21**

## SHAKEPROOF

**OFFERS A COMPLETE FASTENING  
SERVICE . . . A REAL AID TO  
PRODUCT IMPROVEMENT!**

Modern fastening techniques, such as those developed and recommended by Shakeproof Engineers, have led to the improved utility of countless products. These engineers, with their thorough knowledge of fastenings and the materials with which they are used, are well qualified to help you in obtaining the most efficient locking for your particular applications. Shakeproof offers you this service in the interest of product improvement—without obligation.

There's a "plus" value to the Shakeproof service... providing you with the choice of six standard lock washer styles... all incorporating the exclusive Shakeproof tapered-twisted tooth locking principle. Such a combination assures locked-tight, vibration-resisting efficiency. Call in a Shakeproof engineer—let him analyze your products and show you how these fastenings will help give them a longer life and more satisfactory performance. Write today!

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Shakeproof Type 1  
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Shakeproof  
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Screws for Plastics



Sems Fastener Units  
Pre-Assembled Shakeproof Lock  
Washer and Screw



Shakeproof Cowl  
Fasteners... "The Quick-  
Opening Lock"

## OPA Revises Malleable Iron Casting Price Method Regulation

Washington

• • • Provisions of the malleable iron castings regulation governing alternative pricing methods that sellers may use in determining their maximum prices have been modified, OPA has announced, to permit the use of either the pre-base period method or the formula method on all deliveries of castings made on orders received or contracts entered into prior to June 30. In all other cases, if the seller elects to sell or deliver castings on or after this date at his pre-base period maximum prices, he cannot afterwards shift to formula prices, according to OPA.

Until recently, sellers could make such shifts without restrictions and used whichever pricing method was more advantageous. However, OPA found that this practice made maximum prices indefinite and uncertain, and consequently the regulation was more difficult to enforce.

To correct this condition, OPA issued an amendment forbidding this practice, effective May 31, but applicable to all deliveries commencing 30 days later. Since sellers may have been pricing on the pre-base period method with the expectation of shifting to the formula method, OPA said at that time, this 30-day period would afford sellers time to change to the formula method of establishing maximum prices should they so desire.

The new action became effective June 23. It was taken when it was found that this 30-day period, which expired June 30, was insufficient with respect to orders received or contracts entered into prior to the expiration date, OPA said.

The base period for pricing purposes is Oct. 1-15, 1941. The "formula" method establishes maximum prices for the castings not contracted for sale or quoted in a published price list during the base period by use of the seller's pricing formula which he used on Oct. 15, 1941 (with overhead rates based on operations in the first six months of 1942).

Under the "pre-base period" method, which the seller can use in lieu of the "formula" method, he uses as his maximum prices for casting not contracted for sale or quoted in a published price list during the base period, the price at which he last delivered the casting prior to Oct. 1, 1941.



**FORD TRIBLOCS**  
**for faster production**

• Today's demand (and tomorrow's too) is for faster production. **FORD TRIBLOCS** can help meet that demand. They are fast in operation—they are sturdy—they are on the job ready for instant use.

**TRIBLOCS** save money for their users, because of their low first cost, and because of their low maintenance expense.

The **FORD TRIBLOC** is a quality spur-gear hoist. It is made throughout of high-grade drop forgings and malleable castings of certified grade. Its **ACCO** high carbon heat-treated chain has great strength and wearing qualities. Write for information on **TRIBLOCS** in 1/4-ton to 40-ton capacities.

Order from your Distributor

**FORD CHAIN BLOCK DIVISION**

Philadelphia, Chicago, San Francisco, Denver  
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**AMERICAN CHAIN & CABLE COMPANY, Inc.**  
BRIDGEPORT • CONNECTICUT



COMING ATTRACTION!

AWAITED BY EAGER AUDIENCES EVERYWHERE

*Steels*

OF TOMORROW...

RIGHT AND BETTER THAN EVER



## READY FOR YOUR NEXT BIG SHOW

THE meritorious Wartime job of iron and steel is front page news—and the industry widely acclaimed for almost unbelievable production. But there are other challenges awaiting in the coming peacetime. They will be met. The ingenuity and skill of the producers will elevate iron and steel to still greater importance—to play the lead role in the new products of tomorrow.

As always, Ohio Ferro-Alloys Corporation will be ready to meet the exacting requirements of ferro-alloy users—to assist with the problems, guided by this organization's constant research and extensive experience in iron and steel production.

FERRO-SILICON 50%, 75%, 85%, 90%

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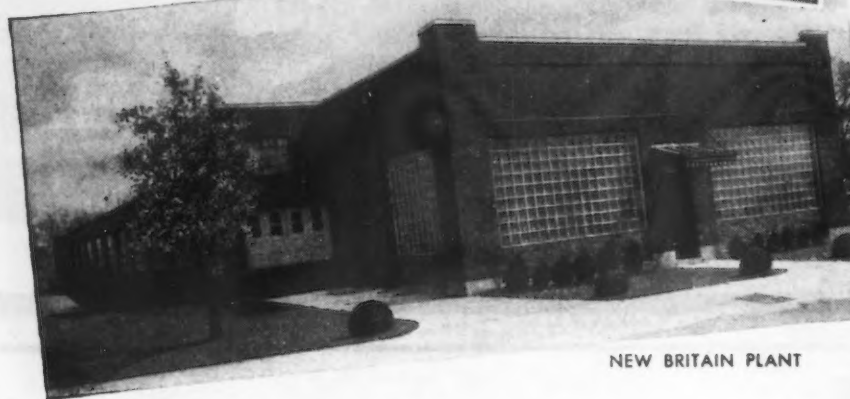
OFA SILICON, MANGANESE, CHROME



*Ohio Ferro-Alloys Corporation*  
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## THREE GENERATIONS OF MACHINE BUILDERS

HARTFORD  
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NEW BRITAIN PLANT

## Look to FENN for Your Special Machinery Needs

Fenn Plants, wholly engaged in war production today, will, when peace comes, continue building special machinery, in which they have majored for three generations. If you are thinking of building new machines or remodeling old ones, it's time to plan Now. Fenn designers and engineers have solved many knotty problems in machine design, resulting in efficient, profitable production. Fenn has the men and experience to handle almost any machine design job. Consultation is invited and involves no obligation.

### *Fenn Aircraft* BUILT PARTS FOR FAMOUS PLANES

Fenn Plants are delivering precision parts and sub-assemblies for planes, artillery and other vital war equipment to practically every industrial center.

**THE FENN MANUFACTURING CO.**  
HARTFORD, CONNECTICUT

## War Department Issues Call for More Skilled Electrical Workers

Washington

••• The War Department issued a call on June 26 for skilled electrical workers who will volunteer to serve for a period of at least 90 days on two different but equally vital war construction jobs—the Hanford Engineer Works, Pasco, Washington, and the Clinton Engineer Works, Knoxville.

The call for volunteers was issued by Robert P. Patterson, Under Secretary of War, after a personal conference with Edward J. Brown, president of the International Brotherhood of Electrical Workers. Subsequent conferences were held between representatives of the War Department and Laurence W. Davis, general manager of the National Electrical Constructors Association.

Under the plan, electrical workers now employed by construction contractors, utility companies and electric shops of all types will be asked to take a leave of absence for work on one or the other of these two critical projects. The War Department has requested the cooperation of employers to make certain that men who volunteer will retain their seniority rights and will have a job open for them upon their return.

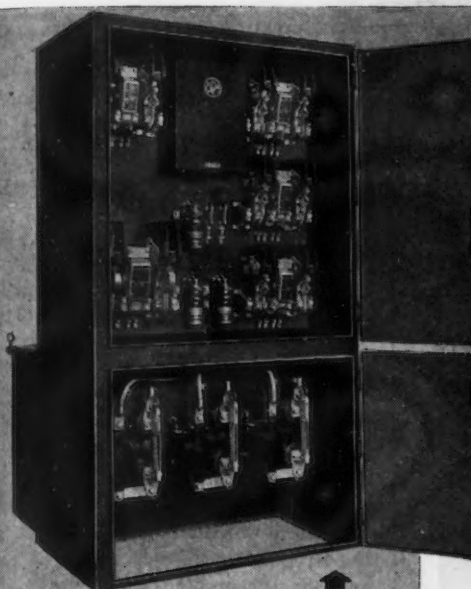
Men volunteering for service, upon completing 90 days of satisfactory work, will be issued a certificate of service signed by the Under Secretary of War. This certificate will acknowledge the service of these men to their country in this war emergency. Employers granting leaves of absence to their men to work on these projects also will receive recognition in the form of letters from the Under Secretary of War.

Those volunteering for service on the projects will be paid the regular scale of wages for their work. At the Hanford works the wage rate is \$1.68 per hr., with total earnings of \$100.65 for the standard 54-hr. week. At the Clinton works the wage rate is \$1.50 per hr. with total earnings of \$105.00 per week for the standard 60-hr. week. Union officials and others who have inspected the projects state that living conditions are the best they have encountered on construction projects.

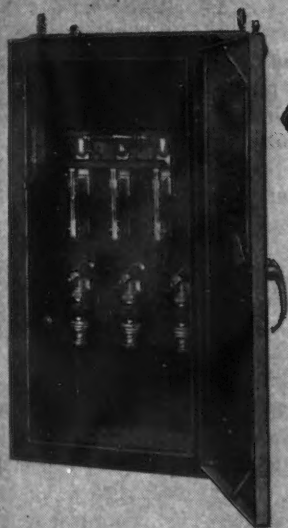
Transportation of men to the projects and other details will be handled by the various local unions of the International Brotherhood of Electrical Workers. Information also may be obtained from USES.



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For  
WOUND-ROTOR  
MOTORS  
2300 Volt Complete Starter



Reduced Voltage Squirrel-  
Cage Starter, 600 volts or  
less.



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SQUIRREL-CAGE or  
SYNCHRONOUS  
MOTORS  
Above: Full Voltage Starter  
for 2300 or 4600 volt  
motors. At left: 600 volt  
or less Full Voltage Starter.



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**W**ITH these EC&M combination starters you not only save ordering time, installation time, and materials, but also get shock-proof, safe units which can be mounted in a control room or out in the plant alongside the motors they control.

Each is completely wired, totally enclosed and equipped with interlock on the disconnect switch door. This small but important feature eliminates the danger of shock or burns to inexperienced help and also safeguards against the momentary mental lapse of an older employee.

EC&M builds these starters for all types of motors, for voltages up to 4600 volts, as well as for full or reduced voltage starting. Fill in the coupon below, checking the type of control suited to your needs and full information will be sent promptly. No obligation, of course.

THE ELECTRIC CONTROLLER & MFG. CO.  
2700 East 79th St. Cleveland 4, Ohio

Gentlemen:

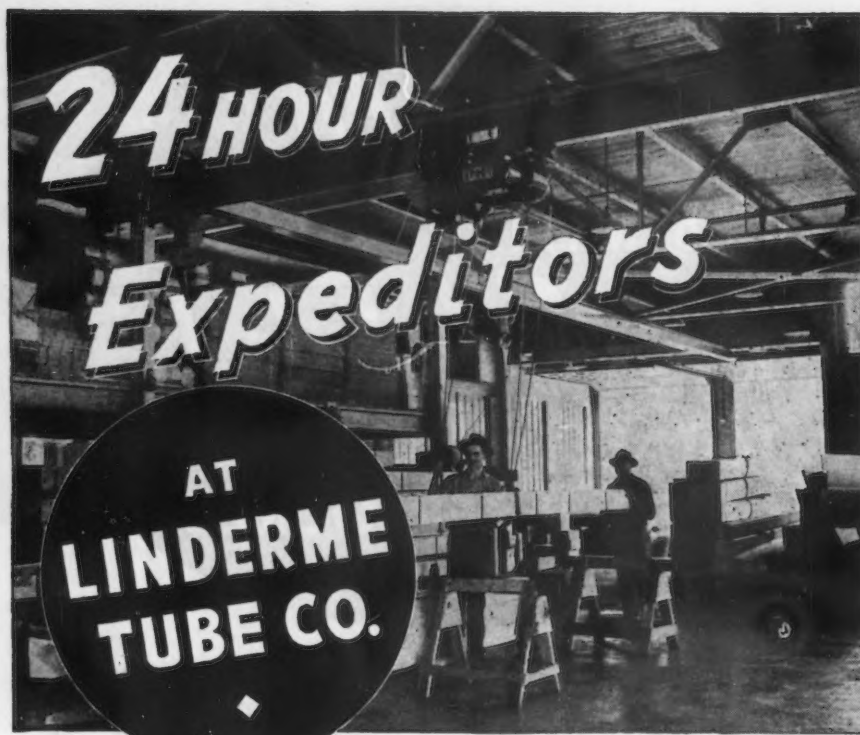
Please send me information on EC&M Combination Starters for

Reduced . . . . . or Full . . . . . voltage starting of a . . . . . H.P., . . . . . Volt Motor  
(Sq. Cage . . . . . , Wound-Rotor . . . . . , Synchronous . . . . . )

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Mile after mile of seamless copper, brass and aluminum tubing daily speeds into the production battle from the Linderme Tube Co. plant at Cleveland, Ohio.

Six strategically located EUCLID HOISTS expedite manufacturing, handling and shipping operations here. They work continuously, 6 and 7 days weekly requiring very minor maintenance and no major repairs whatever!

EUCLID features, which contribute to many amazing performance records, include: liberally proportioned parts throughout, the best type of anti-friction bearings, advanced methods of lubrication and quick easy facilities for inspection, adjustment and repairs.

These features combine to afford a long life of trouble-free service as evidenced by the impressive number of prominent industrial concerns who have standardized on EUCLID HOISTS.

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WE CAN DELIVER  
A LIMITED  
NUMBER OF  
5 to 10 TON  
CRANES  
in  
60 to 90 Days



## Gaylord Contests SEC Statement on Capital For Postwar Industry

New York

• • • Robert Gaylord, president of the National Association of Manufacturers declared this week that the SEC not only overstepped its functions but also misled the public when it stated that all industry has plenty of working capital to convert to peacetime operations without financial aid.

Outraged Mr. Gaylord said that complete statistics to make such a statement were not available and that the SEC interpretation of such figures as it has assembled "is either unintelligible or done for some purpose not clear." If an industrial corporation, he said, trying to sell stock, used the same methods of interpreting its financial position, the commission itself would charge it with trying to fleece the public.

The NAM executive, who is also president of Ingersoll Milling Machine Co., Rockford, Ill., said that many business men are wondering why the SEC goes so far out of its own sphere to make predictions of this kind.

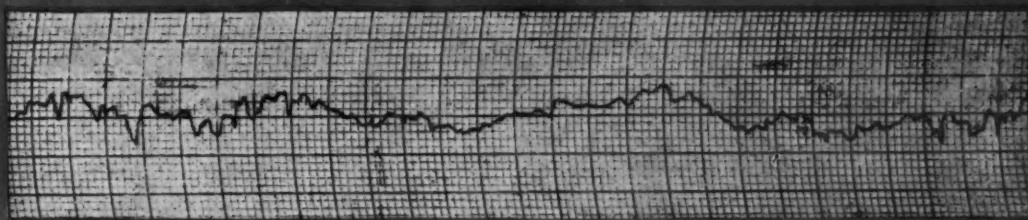
The story released by the commission, he said, indicated that industry's working capital has risen 70 per cent over 1939. Yet when detailed figures were issued nine days later in a sample study on June 18, the increase in working capital over 1939 figures was 49 per cent. The commissioners do not permit such arithmetic, he ventured, when industry files its figures with them.

**WIRE CUTTER:** A Yank poses beside the metal wire cutter attached to a Jeep somewhere in the Italian theater of war. The cutter is used to get through wires strung across roadways as an impediment to military transportation.





# Proof of a Better Finish



## Surface Analyzer Tape Proves You Get a Better Finish with Chicago Wheels

These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used,  $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{8}$ ", Grain 180, Grade L Arcite FV Bond. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do it with Chicago Wheels. And, the secret of their superiority lies in the new FV Bond, developed exclusively for Chicago Wheels, after 50 years' experience making wheels for the most accurate and precise applications.

### HERE'S WHAT FV BOND WILL DO FOR YOU

\*Reduce your wheel costs

\*Produce a better finish without sacrifice of production time — a finish so smooth that you can measure it in micro inches.

### TRIAL WHEEL FREE

Write or send the coupon today for a Chicago Wheel, made with this remarkable new FV

Bond. Tell us grinder you use, size wheel and kind of material on which you will make your test.

For the duration, with full WPB approval, we are specializing on small sizes—anything up to 3" in diameter.

Write for Catalog and one of the new Engineering Survey Forms, a step in the direction of better finishing.

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Industry.



## CHICAGO WHEEL & MFG. CO.

America's Headquarters for Mounted Wheels and Small Grinding Wheels

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Send Catalog and Survey Form. Interested in  
( ) Mounted Wheels. ( ) Grinding Wheels.  
( ) Send Test Wheel. Size.....

Name .....

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## Speeding Production of Aircraft Engines

This unit, designed and built by an aircraft company, utilizes seven 17" Delta drill press heads for drilling, tapping, and reaming valve tapped holes on an aircraft engine crank case.



**Save Time and Money**  
on post-war retooling and current  
change-overs . . . with ingenious  
adaptations of low-cost, stock model  
**DELTA TOOLS**



**140 EXAMPLES**  
**from War-Production**  
**in Delta's new 76-page**  
**BLUE BOOK**

This colorful book pictures and describes a wide range of applications — actual case histories which give your production men a running start on your own special problems.

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**DELTA**  
**MILWAUKEE**  
**Machine Tools**

THE DELTA MANUFACTURING CO.  
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Please send me my free copy of your new 76-page  
Blue Book, and catalog of low-cost Delta tools.

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In war plants the country over, special-purpose machines have been built around standard Delta components at a fraction of the cost and in a fraction of the time ordinarily involved, increasing production 200% to 600%. By adopting this modern tooling practice, you can design a machine to do a specific job without tying up heavy capital in costly, complicated machines which are slow to build and difficult to adapt. The results are more production in less time at lower cost. In addition, this minimum capital investment is flexible — your machines are composed chiefly of standard elements which are readily convertible when change-overs are required. Investigate!

MA-9

**New Book Suggests**  
**10,000 Civilian Jobs**  
**For Returning Vets**

**Washington**

••• Ten thousand civilian jobs related to military occupational specialties of returning veterans have been listed in a 500-page volume entitled "Special Aids for Placing Military Personnel in Civilian Jobs," soon to be used in the 1500 local offices of the U. S. Employment Service and was made available to employers and others interested, Paul V. McNutt, Chairman of the War Manpower Commission, announced recently.

The purpose of the volume, now on the press, is to indicate how military experience and training of veterans may be utilized in a return to civilian life, Mr. McNutt said. The volume, a companion piece to one published recently to assist in placing Navy personnel in civilian jobs, he said, has created widespread advance interest on the part of hundreds of large employers who are eager to utilize the services of returning veterans.

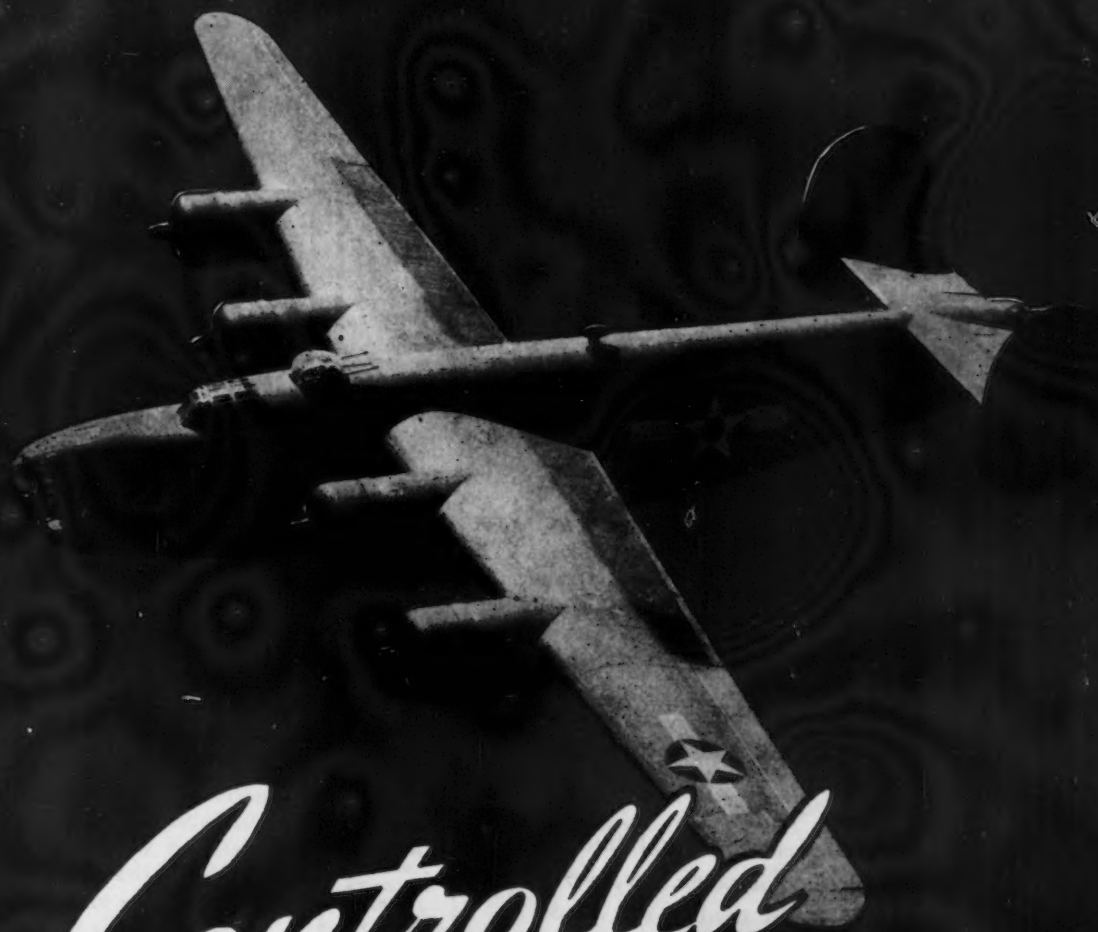
"The 'Special Aids,'" Mr. McNutt said, "are intended as an aid to achieving the fullest possible utilization of returning servicemen in terms of their military training and experience only. Previous civilian experience has not been taken into consideration in the compilation of the volume.

"The 'Aids' have, however, been devised for both men and women, those in need of further training and those ready for immediate placement, those having physical limitations and those having none."

Mr. McNutt said the "Aids" can be used in the following ways:

1. To counsel or place personnel who have only military training and experience and lack previous civilian experience and training upon which to base recommendations.
2. To counsel personnel whose previous civilian experience and training has shrunk in significance when compared with military experience and training.
3. To counsel personnel who are physically handicapped and are, as a result, unable to return to their former civilian occupations.
4. To counsel personnel in new fields of work because of a lack of present opportunities in former fields of civilian work.
5. To counsel personnel who desire



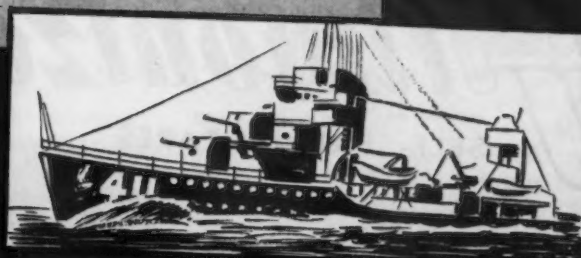
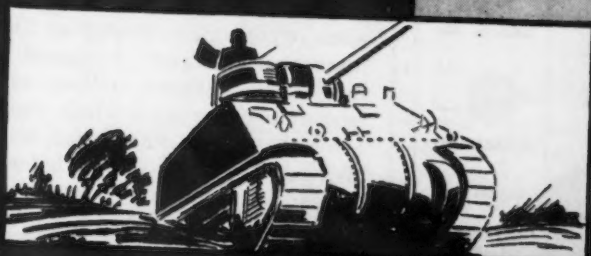


# Controlled

COLD DRAWN  
CARBON and ALLOY STEELS

Turned and Polished,  
Turned and Ground  
Shifting, Annealed,  
Stress and Strain Re-  
lieved, Heat Treated,  
Quenched and Tem-  
pered. When  
Shipped Up to 12" x 2"

**QUALITY-IDENTIFIED**  
*Performance*  
**IN EVERY VICTORY**

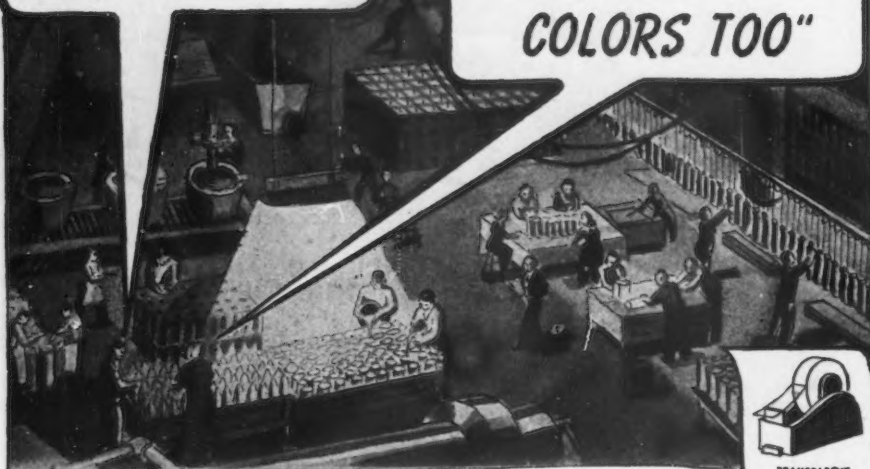


## WYCKOFF DRAWN STEEL COMPANY

FIRST NATIONAL BANK BLDG. PITTSBURGH, PA.  
304 SOUTH MIDDLE AVENUE CHICAGO, ILL.  
Sole at Pittsburgh, Pa. and Chicago, Ill.

"LOOK JOE,  
NEW PRINTED,  
TAPE FOR  
DECALS!"

"YEAH, IT LABELS  
AND SEALS IN  
ONE OPERATION  
AND COMES IN  
COLORS TOO"



Something new in pressure sealing tapes. Filmonize printed tape in a complete color range, one, two or three colors on one roll — now used in war plants for identification because the colors won't fade and the printing can't rub off — for labeling and sealing in one operation because that saves time and production cost — in place of decals because Filmonize goes on ten times faster than decals and lasts forever. Place a trial order with your distributor and let your experience prove, *you've never had as good a tape.*

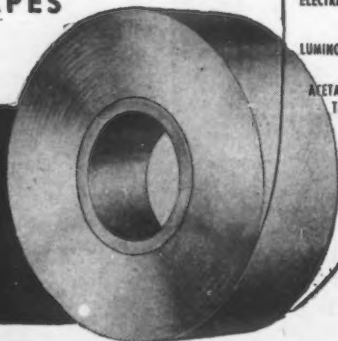
### Filmonize Sets New Standards

- Easy to use . . . strips cleanly off the roll.
- No "curl-back" . . . no tangle . . . no waste.
- Fade-proof colors . . . printing sealed in.
- Widths from 1/2" to 18" throughout the Filmonize line.

**Filmonize**  
TRADE MARK REG  
SELF-SEALING TAPES

**INTERNATIONAL  
PLASTIC  
CORPORATION**

MORRISTOWN, N. J.



TRANSPARENT  
TAPES



SINGLE AND  
MULTI-COLORED  
TAPES



MASKING  
TAPES



PRINTED  
TAPES



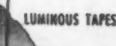
CUSHIONED RIVETING  
TAPES



IDENTIFYING  
TAPES



ELECTRICAL  
TAPES



LUMINOUS  
TAPES



ACETATE FIBRE  
TAPES

to make a vocational change and who have enjoyed the kind of work they had in the Army.

Mr. McNutt said WMC was influenced by three factors in the preparation of the "Aids." These factors, he said, are:

1. The fact that many men, inducted immediately out of high school at the age of 18, have had no specific civilian occupational training or experience to fit them for civilian work-life; that as a result, their military training and experience may furnish a significant source of information for counseling or placement purposes.

2. The fact that a number of returning servicemen have physical disabilities as a result of their Army careers.

3. The fact that many men have been dissatisfied with both their pre-war and military occupations and need guidance in choosing a new civilian occupation.

The "Special Aids" were developed by occupational analysts employed by WMC. The Adjutant General's Office of the War Department furnished descriptions of military occupational specialties which were used in developing the lists of related civilian occupations, the announcement said.

The volume contains a series of "Job Families," each of which lists civilian jobs related to a military occupational specialty. It contains all of the military occupational specialties—approximately 600—used by the War Department for classifying enlisted men and women.

Mr. McNutt emphasized that the "Special Aids" will not serve to indicate how service men and women with previous civilian experience and training should be counseled. Since many Army occupations have no exact counterparts in civilian life, the "Aids," he said, were designed primarily for persons who may have the responsibility for suggesting placement opportunities in civilian life for discharged enlisted personnel who have no significant civilian experience or training upon which decisions can be based. In many cases, he said, civilian experience gained before induction into the Army is far more important in terms of post-war placement than military experience.

Mr. McNutt said the "Aids" are intended as a rough guide in making a determination of the relative skill of any returning veteran, and that the level of skill can be determined to some extent by determining whether "G. I. Joe" has been attached to a fighting arm or to a ser-



How Houghton helps  
**A WAR-TIRED PLANT**  
get its  
**"SECOND WIND"**

**1** *By drafting a*  
**SIMPLIFIED LUBRICATION PLAN...**

Competent lubricating engineers can check your machines upon request, setting up a flexible system adapted to your plant's needs, and without disturbing production. The objectives of such a plan are (1) proper lubrication

of every machine; (2) establishing positive lubrication control; (3) reduction in number of varieties of lubricants required. This plan is presented to plant executives in concise and permanent form, easy to follow.

**2** *By supplying*  
**FORTIFIED LUBRICANTS...**

The wise choice of lubricants involves more than following name-plate advice... more than a superficial knowledge of petroleum stocks... more than buying oils on physical properties alone. Selection of the right oils and greases is a serious responsibility today in war plants whose machines have been pushed to full capacity for many months. On that decision may depend the ultimate useful life of the machine and freedom from down-time.

Houghton lubricants are scientifically treated to enable fewer grades to cover more needs and to hold up longer under gruelling war production. These treatments include polymerization, high-film-strength, corrosion-inhibiting, gum solvency and oxidation stability. The Houghton Man can tell you how "Oil with Guts" can fortify the war-tired plant. Ask him, or write E. F. HOUGHTON & CO., Philadelphia 33, Penna.

**FIRST AID FOR OVER-WORKED MACHINES:** High-film-strength, polymerized Sta-Put Lubricants ★ Dynamo-Turbine-Compressor D. L. Absorbed Oils ★ Fortified-film "High-V.I." Hydraulic Oils ★ Reversible, stable "Absorbed Oils" for Ball and Roller Bearings ★ E. P. Spindle Oils, Gear Oils, and a host of other fortified lubricants built for war plant duty.

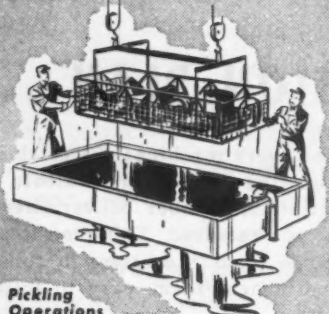
# Safety ALL-WAYS WITH Carey ASBESTO-SORB



**Metal Working**  
Asbesto-Sorb spread over cutting fluid leakage provides sure footing.



**Garage**  
Grease deposits and oil drippage may be swept up with Asbesto-Sorb.



**Pickling Operations**  
A mat of Asbesto-Sorb prevents slippage and reduces danger to workers' feet and footwear.



**Metal Tempering**  
Drippage from oil treated sheets is taken up by Asbesto-Sorb.



**Food Processing**  
In packing, canning and other processing, floors are kept safe with Asbesto-Sorb.

## Absorbs Oil and Grease *Keeps Floors Safe*

Slippery floors are a constant hazard; workers may slip and fall; fires may destroy or damage plant and equipment; acids may injure clothing, tires and materials.

Carey Asbesto-Sorb eliminates these dangers by absorbing grease, oil, water, pickling solution, battery and other drippage. It keeps floors dry and safe—provides secure footing under all conditions. Try a 50-lb. bag—you'll use it regularly just as many other plants are doing. Ask your Safety Engineer to write Department 26 for details.

### THE PHILIP CAREY MFG. COMPANY

Dependable Products Since 1873  
LOCKLAND, CINCINNATI, OHIO  
In Canada: The Philip Carey Co., Ltd.  
Office and Factory: Lennoxville, P. Q.

### Fire Safe!

ASBESTO-SORB is rated "Class 1, Non Combustible" by Underwriters Laboratories, Inc.



vice of the Army. As an example, Mr. McNutt said, a veteran who has been doing communication work for an infantry company can be assumed to be less proficient than a veteran performing the same duties for a Signal Corps company since the former was probably given only rudimentary training in line construction and switchboard work as related to his combat duties. The Signal Corps veteran would be the more fully trained of the two, he said.

An estimate of the level of skill of the veteran can also be formed by the Army rank he attained, the "Aids" indicate. In general, it is pointed out, the veteran who had advanced from the status of private to that of noncommissioned officer is one who has shown certain qualities of leadership and as a result has had certain responsibilities thrust on him and may also be technically the best man in his squad, section, or platoon.

In general, the "Aids" point out, the responsibility of the soldier has increased as rank has increased, but supervision may have extended only to military duties, in which case it may be difficult to determine the level of skill. On the other hand, the "Aids" indicate, the supervision of the soldier may be equivalent to that exercised by the foreman in civilian industry.

### New York Central Tests Diesel Freight Locomotives

New York

• • • Looking forward to postwar improvement in its motive power, the New York Central system has put into experimental operation the first of two diesel freight road locomotives of 5400 hp. This is a step in its program of experimentation with various types of motive power on a competitive basis in actual operation on different lines in the system.

The second diesel freight road locomotive will enter operation soon and after a brief trial period both locomotives will be given their first scheduled road service on symbol freight trains between Elkhart, Ind., and West Springfield, Mass.

Built by the Electro-Motive division of General Motors Corp., the two new locomotives are each in four units, every unit having a 2 cycle, 16 cylinder oil engine. There are two four-wheel trucks under each unit and each truck has two traction motors. The total weight on drivers is 451.5 tons for the entire four-unit locomotive.



For Faster Melting of Quality

*Steels and Irons*



MOORE RAPID  
**Lectromelt**  
FURNACES

★ Lectromelt furnaces of the top charge type, quickly charged by drop bottom bucket, reduce the charging time and the furnace heat loss between melts. This savings permits more rapid heats and greater tonnages of necessary war steels and irons.

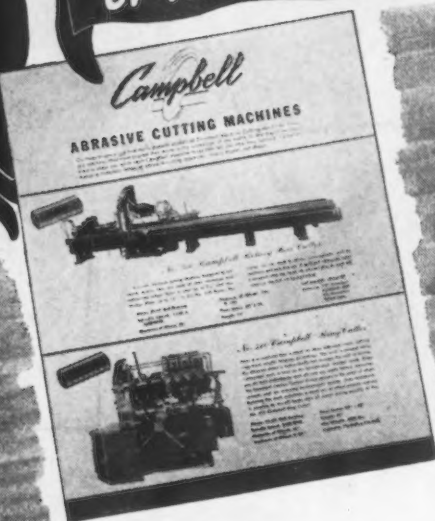
Top charge Lectromelts are constructed in capacities from 100 tons down to 250 pounds. Let our engineers help you with your melting problems.



Lectromelt composite electro-mechanical electrode arm with power operated clamp for gripping the electrodes and conducting the current from the secondary anti-skin effect cables to the electrodes. Another Lectromelt design feature is the electrode clamps, multi-part multi-contact water cooled type (Moore patent).

**Pittsburgh Lectromelt Furnace Corp.**  
**PITTSBURGH, PENNSYLVANIA**

SEND FOR YOUR COPY  
OF THIS FOLDER—



★ ★ ★ "Next best to *knowing* is *knowing how to find out.*" That's why we published this file-size folder—ON CAMPBELL ABRASIVE CUTTING MACHINES. It's a time-saver because it gives you a quick highlight picture of the complete range of Abrasive Cutting Machines made by Campbell. It may suggest to you the particular machine that will help you with your specific cutting problems. You'll want a copy for your files.

Another way to "find out" is this: write to us stating (1) the materials you are cutting, (2) shapes and sizes, (3) lengths before cutting, (4) lengths of cut-off pieces and (5) required production per hour. With this information, Campbell engineers can work up cost sheets for you and recommend production procedure, based on actual records.

Write for the above folder—or for information on your specific cutting problem.

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**ABRASIVE CUTTING MACHINES**

**ANDREW C. CAMPBELL DIVISION**  
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**AMERICAN CHAIN & CABLE COMPANY, Inc.**  
BRIDGEPORT • CONNECTICUT

## Steel Industry Makes Record in Power, Oil, Coal, Gas Consumption

**New York**

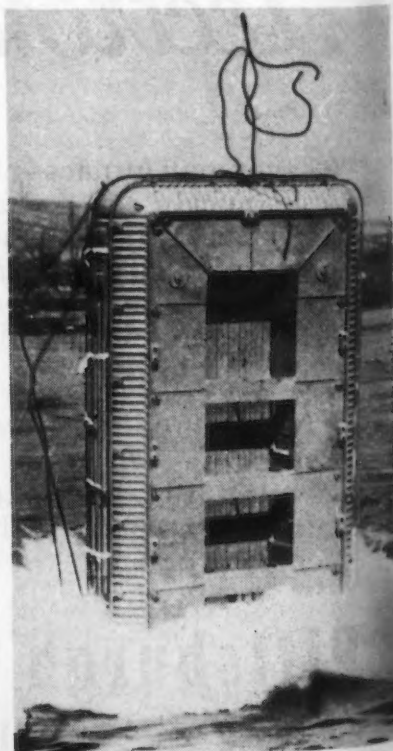
• • • In the record-breaking production year 1943, the steel industry consumed electricity enough to supply 17,178,000 families for 12 months; fuel oil sufficient to heat 1,406,000 homes for a year; coal equivalent to a year's consumption in 12,986,000 houses; natural gas for 14,470,000 residences for a year.

These estimates were prepared by the American Iron and Steel Institute and cover only part of the materials consumed last year by the steel industry, which probably uses a greater quantity of raw materials than any other industry in the world.

All told, the industry charged into its blast furnaces and steelmaking furnaces 313,364,000 tons of raw materials in 1943, exclusive of ferro-alloys and alloying elements. This represented consumption of nearly five tons of raw materials for each ton of finished steel produced.

Fuels consumed by the industry,

**TOUGH TEST:** This metal life raft, built by Weber Showcase Co., Los Angeles, splashes into the water during tests. It was dropped three times into the water from a height of 45 ft. without damage. About 1020 steel sections are used in its construction, and its 44 manganese-bronze drain flanges are joined to the steel sections by low temperature silver brazing.







Users are putting great emphasis on the statement that the Empire Floating Tool Holder is

## The First Floating Tool Holder that Compensates for BOTH Parallel and Angular Misalignment

In letters and by word of mouth users are expressing their genuine pleasure with the performance of this new Empire Floating Tool Holder. They say it is the only one that really floats, and corrects angular and out-of-parallel misalignment. No bell mouths can occur. Holes can be reamed to close tolerances — starting with the very first one you ream. Having only five parts — easily disassembled — the holder has a reduced wear factor. By referring to diagram you will note that the cap and shank

float independently of each other, achieving a free and easy movement—a unique engineering design not present in any other floating tool.

Available with holes and sleeves in following sizes:  $\frac{3}{8}$ ",  $\frac{1}{2}$ ",  $\frac{5}{8}$ ",  $\frac{3}{4}$ ", 1",  $1\frac{1}{4}$ ",  $1\frac{1}{2}$ " with shank diameters:  $\frac{5}{8}$ ",  $\frac{3}{4}$ ", 1",  $1\frac{1}{4}$ ",  $1\frac{1}{2}$ ",  $1\frac{3}{4}$ ", 2",  $2\frac{1}{4}$ ". These Holders are available for any machines from the smallest Brown & Sharpe Automatics to the largest hand or automatic screw machines.

**Try an Empire Floating Tool Holder for 30 days.**  
If you're not thoroughly satisfied, return it for full credit.

SEND FOR CATALOG

BUY WAR BONDS

Also manufacturers of Empire Tool Company's Luers Patented Cutting-off Blades and Holders, and distributors of Fastcut Centerdrills and Keyseat Cutters.

# EMPIRE Tool Co.

8788 Grinnell Ave.  
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# ARMSTRONG

## Make haste and prevent waste with ARMSTRONG TOOL HOLDERS

There is no easier or better way to speed up production on lathes, planers and shapers than to tool each with the correct ARMSTRONG TOOL HOLDERS for every operation and then increase speeds and feeds.

With the correct ARMSTRONG TOOL HOLDERS for each operation you can safely and efficiently machine at speeds and feeds often double the so-called "standard" metal-cutting speed established in the old forged tool day. Each has strength beyond any needs, each holds cutters at the most efficient cutting angle, provides maximum tool clearance and visibility. Each takes standard shaped cutters any mechanic can quickly grind and "Saves: All Forging 70% Grinding and 90% High Speed Steel . . . prevents waste of our greatest wartime needs: man-hours, machine-tool hours and high speed steel."

### ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

309 N. Francisco Ave.,  
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Eastern Sales Office:  
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ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

exclusive of coal, totaled 226,784,000 gallons of tar and pitch; 2,109,425,000 gallons of fuel oil; 868,172,000,000 cubic feet of natural gas and 18,380,000,000 kilowatt hours of electric power. Almost 40 per cent of the electric power used was produced in generating plants operated by the industry itself.

Of its total consumption of 90,905,000 tons of coal last year, the industry used 84 per cent in the production of coke for the operation of its blast furnaces. The remainder was used to produce steam, generate electricity and as a general-purpose fuel.

Blast furnaces consumed 64 per cent of the total of 313,364,000 tons of raw materials used in 1943. The principal materials going into these furnaces included 108,025,000 tons of iron ore; 56,701,000 tons of coke; 24,248,000 tons of limestone; 7,152,000 tons of cinder and scale; 3,694,000 tons of scrap.

Materials charged into the steel-making furnaces included 51,956,000 tons of pig iron; 47,106,000 tons of scrap; 7,385,000 tons of ore; 6,534,000 tons of fluxes and 563,000 tons of cinder and scale.

## Crane's 3rd Edition Retitled

New York

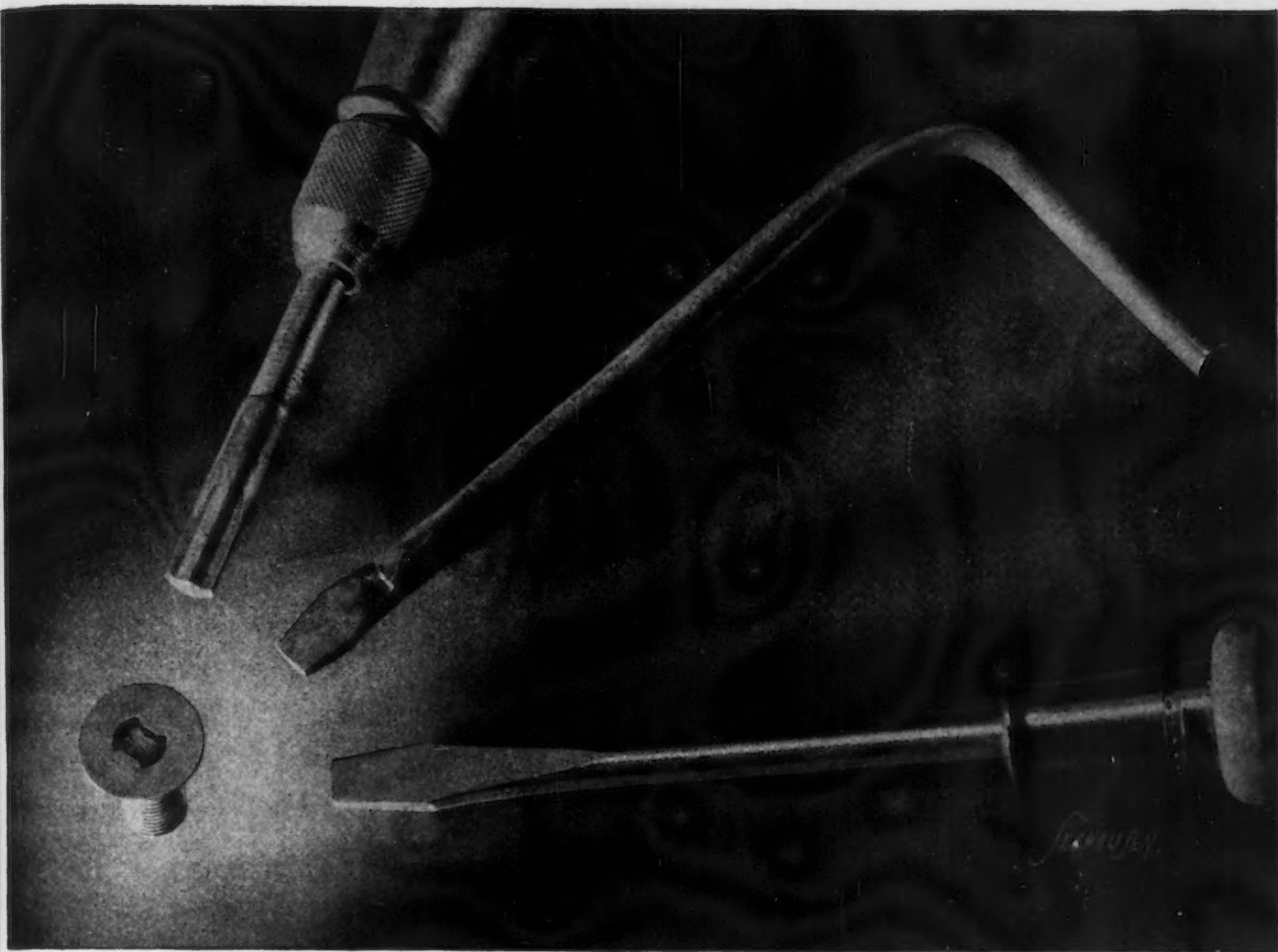
• • • The third edition of E. V. Crane's book — "Plastic Working of Metals and Non-Metallic Materials in Presses"—published by John Wiley & Sons, Inc., has been appropriately retitled in recognition of the expanding range of engineering materials.

Large numbers of synthetics and alloyed materials recently developed are plastically workable. The author shows how these materials and their states govern the combination of working pressure, temperature and time allowance required to produce a particular shape. To present the broadened view of plasticity and mass production, three chapters have been added along with new material in the appendix and through the text. One of these chapters discusses the use of semi-permanent die materials in more flexible presses for limited lot production; the second goes into the behavior of many types of materials in the several states of plasticity, and the third considers the application of plastic flow methods to the molding of non-metallic as well as metallic powders and to the forming of sheet plastics and composite laminates.



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## With Clutch Head—Either Will Do

This is the only modern Assembly Line screw so designed that it also operates with an ordinary type screwdriver . . . even with a piece of flattened steel rod in emergency. The only requirement is that the screwdriver or flattened rod be reasonably accurate *in width*. The thickness of the blade, so important with other screws, is a secondary consideration with CLUTCH HEAD because its roomy recess allows great latitude in this respect. Obviously, a broad tolerance like this is invaluable in field service where the Type "A" Drivers (used for the fast tempo of Assembly Line work) may not be immediately available. This logical simplified design applies to all sizes and styles of CLUTCH HEAD Screws . . . an exclusive feature that is daily proving its worth in the War effort by keeping men and machines in motion when time is vital.

Personally test this feature . . . and the many other exclusive CLUTCH HEAD advantages for faster, safer, and lower-cost production. Ask us to *mail you* package assortment of CLUTCH HEAD Screws and sample of the Type "A" Bit. You will find that CLUTCH HEAD is *The Screw That Sells Itself*.

You may order CLUTCH HEAD Screws in Standard and Thread-forming types for every purpose. Their production is backed by the resources of this Corporation and by those of responsible Licensees.

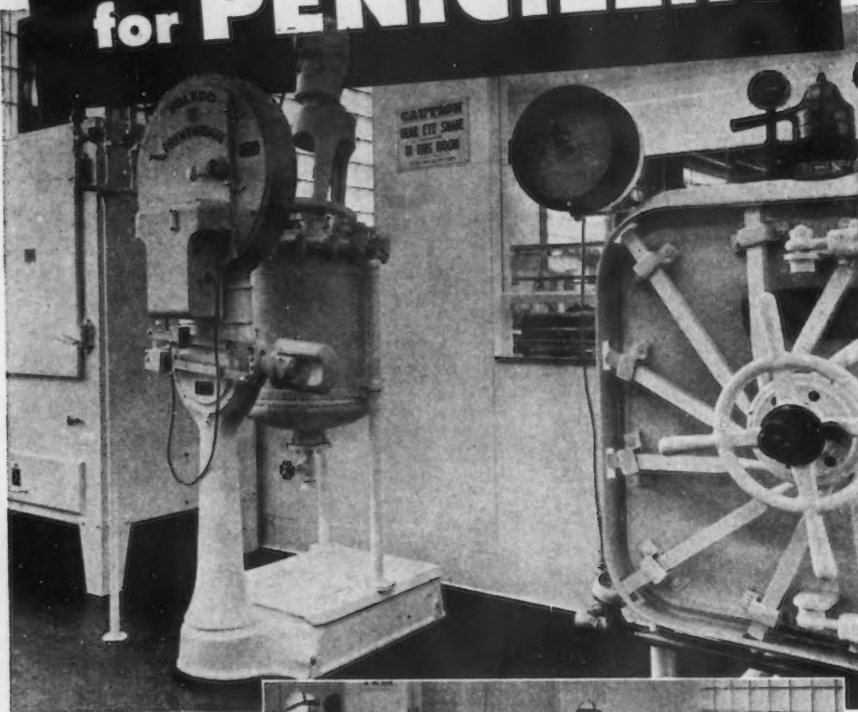


This rugged Type "A" Bit is an important lower-cost item. It delivers longer uninterrupted service and a 60-second application of the end surface to a grinding wheel restores its original efficiency.

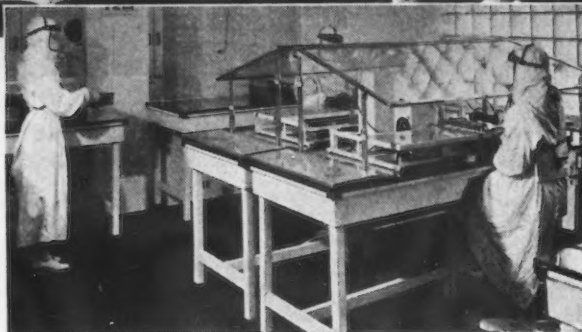


**UNITED SCREW AND BOLT CORPORATION**  
CHICAGO CLEVELAND NEW YORK

# PRINTWEIGH for PENICILLIN



Above—View taken in the newly constructed plant at Commercial Solvents Corporation, Terre Haute, Indiana, showing the room in which vials are filled with Penicillin—C.S.C.



● Penicillin—one of the greatest discoveries of modern medical science—looks to Toledo for unerring printed weight records during the long, complicated production process.

In this modern new plant, Toledo Printweigh keeps accurate weight control of the concentrated solution—the precious product which is obtained in mere 20-gallon lots from each of the huge fermenting tanks.

Similarly—in every conceivable branch of industry today—Toledos are specified for utmost accuracy, speed and dependability in weighing, balancing, force-measuring, counting... Toledo Scale Company, Toledo, Ohio.



# TOLEDO

HEADQUARTERS FOR ALL TYPES OF

# SCALES

## Among the Week's Trade Notes

Hy-Alloy Steels Co. has been formed at Chicago by Floyd J. De Van and Henry A. Gluschoff. The firm will distribute alloy steel bars from mill and warehouse stocks.

Reading Chain & Block Corp., Reading, Pa., has appointed J. R. Kindig, Atlanta, Ga., as manufacturers' representative for its line of chain hoists and electric hoists in that territory. The company has also appointed Dunn & Bryan as agent for the New York and New Jersey territory; Transmission Engineering Co. for Southern California, New Mexico, Arizona and Southern Nevada and the Alaska Junk Co. for Oregon.

Cutler-Hammer, Inc., Milwaukee, has recently opened a new "drive-in" warehouse at 1200 Walnut Street, Cincinnati. E. C. Bolton is in charge.

Remington Rand, Inc., will move its tabulating machine and export division from Buffalo to the Remington Rand Building, 315 Fourth Avenue, New York, about Aug. 1. Main operating office will remain in Buffalo.

Master Engineering Co., Milwaukee, has been organized to engage in manufacturing and tooling of machine parts.

Nichol Machinery Co., Inc., Milwaukee, is a new firm that will deal in machinery and parts.

Bunting Brass & Bronze Co. has appointed Frank J. Brogan as special sales representative in Texas, Oklahoma, Arkansas, and Louisiana. Mr. Brogan's headquarters will be in Dallas, Tex.

American Screw Products, Los Angeles, a division of the Deutsch Co., has announced that its operations will be conducted under the firm name, the Deutsch Co.

Meehanite Metal Corp., New Rochelle, N. Y., announced that two additional companies are now in production of Meehanite castings in India—Jessops & Co., Ltd., Calcutta, and Binny & Co., Ltd., Madras.

L. J. Wing Mfg. Co., New York, announces the appointment of the following new representatives: Clidden Engineering & Equipment Co., Dallas and Austin, Tex.; E. Lloyd Widener, Knoxville, Tenn.; Babcock & Wilcox, Ltd., of Mexico, Mexico City, and Sergio Ortiz Toro, Caracas, Venezuela.

Crosley Corp., Cincinnati, has appointed the Graybar Electric Co., Inc., Portland, as distributor in Maine.

Minnesota Mining & Mfg. Co., St. Paul, has appointed the Minneapolis office of Batten, Barton, Durstine & Osborn as advertising agency on all products. This will be effective on July 1.

Hercules Powder Co., Wilmington, Del., announces that its Hercules Mixer, the company's house magazine, has been awarded third prize in the nationwide cover contest sponsored by the American Red Cross to promote the 1944 war fund campaign.

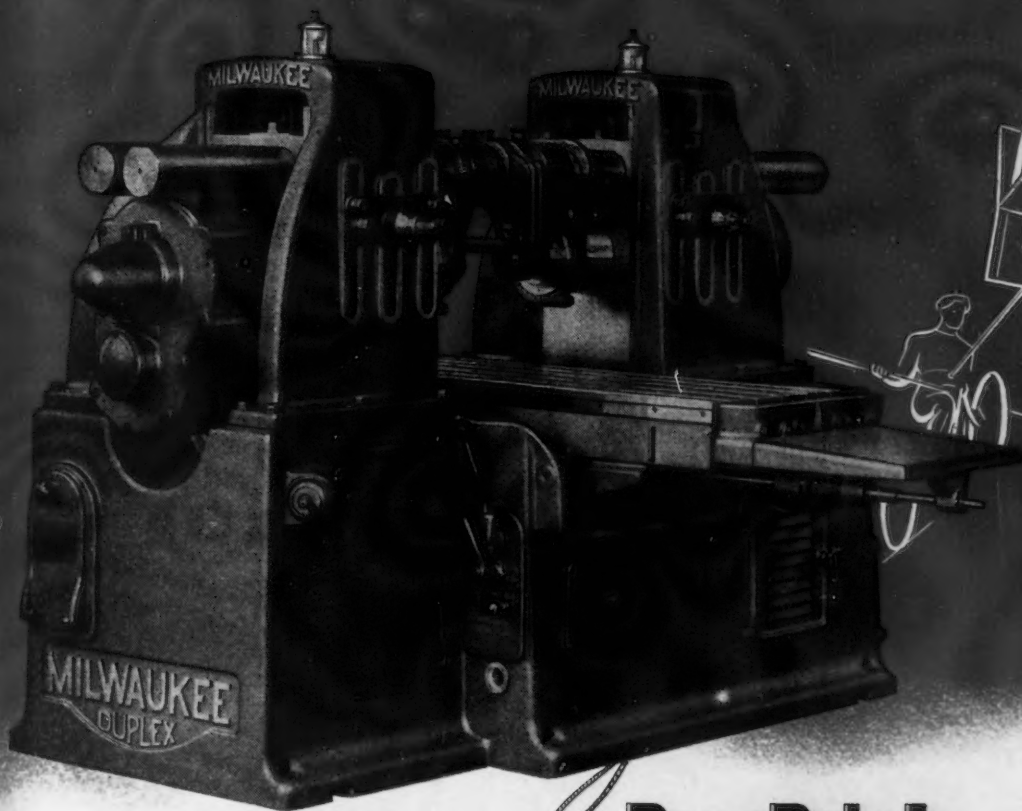
American Car & Foundry Motors Co. and the Brill Corp. directors have approved a merger and capital readjustment plan which will integrate the two companies under a single corporate structure. The new company, as proposed, will be known as the A.C.F.-Brill Motors Co. On July 26 stockholders of the two companies will be asked to vote on the plan.

American Rolling Mill Co. has purchased the assets of the Ohio Corrugated Culvert Co., Middletown, Ohio, and the Shelt Co., Elmira, N. Y. Both companies will be operated by the wholly-owned Armco subsidiary, Armco Drainage & Metal Products, Inc.



# PowerRated

For BALANCED POWER  
and PERFORMANCE



**PowerRated**

Engineered for a  
Specific HP. Range

MEANS EVERY  
MILWAUKEE MACHINE IS POWER  
ENGINEERED TO DO THE JOB

Milwaukee PowerRated Milling Machines

- Standard Models — Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 HP.
- C.S.M. (Carbide Steel Milling) machines — 20 to 50 HP.
- Special Machines — Consult K&T engineers.

**PowerRated**

ENDS THE WASTE AND  
HIGH COST OF "MONGREL" MACHINE TOOLS

Sound machine tool design demands thorough consideration of the motor hp. A No. 2 milling machine, for example, is designed and built in keeping with its motor hp. — plus the normal overloads to be expected in relation to the size of work to be milled.

Substituting a higher hp. motor to gain power and speed above that of the motor normally specified for a No. 2 milling machine results in a "mongrel" machine, incapable of sustained precision performance — as well as of doubtful value in terms of providing additional production in keeping with its "extra" cost. The power is excessive and out of balance with the design and construction of a No. 2 and its proper range of performance.

Milwaukee Milling Machines are power-engineered — *PowerRated* — each machine has a specific hp. rating in relation to the type of jobs to be milled.

When you are considering the purchase of a milling machine—think in terms of motor hp. for heavy cuts, range for light cuts. Check the advantages of Milwaukee *PowerRated* machines.

*Back the Attack!* BUY MORE BONDS

**KEARNEY & TRECKER**

CORPORATION

MILWAUKEE 14

WISCONSIN



*Milwaukee Machine Tools*

*Keeping quality at***Par**

*The use of only the highest grade scrap and pig iron obtainable goes a long way toward keeping the quality of Strong casting steel up to par. Beyond that, this quality is further safeguarded by the constant vigilance of the laboratory.*

*Each heat is subjected to rigid chemical and temperature checks during the refining process and a running record is kept of the chemical and physical properties of every melt.*

*Only from trouble-free steel can trouble-free castings be made.*

STRONG IN NAME  
STRONG IN FACT

STRONG STEEL FOUNDRY COMPANY, BUFFALO, N.Y.



# Strong

TENSILE STRENGTH • ELONGATION

## Shortage of Labor In Canadian Steel Mills Delays Consumer Goods

**Toronto**

• • • Canada has swept back to capacity operations on war materials production and under the new program the steel supply situation has tightened to such an extent that wide scale manufacture of consumer goods on civilian account has been indefinitely postponed. Only the most critical of civilian requirements will be turned out. Government officials further state that efforts are underway to step up importations of various steel materials to cope with the expanding demand. Labor has become a serious problem and due to shortages in various steel plants production schedules have been unable to reach capacity, although output now is running at about 92 per cent.

While shell producers are being given first preference in steel supply, big demand also is reported from builders of landing barges, ships and locomotives, with automotive plants also obtaining large tonnage supply. In most other lines of war output, however, there has been slackening production. The Nobel works has been reopened for production of explosives but so far there is not sufficient labor available to enable full time operations.

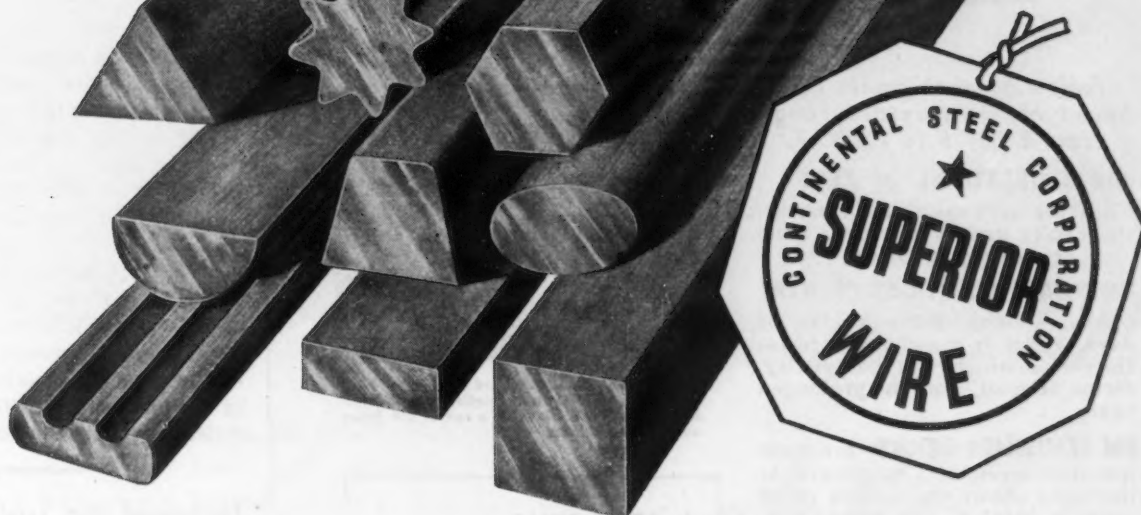
Most steel producers report backlogs that will absorb practically all output to the end of the year. Principal demand centers on sheets, plate and bars, both carbon and alloy. The heavy outpouring of orders that featured the market over the past two months has placed producers in a position where they are unable to accept further bookings on some steel materials while at the same time it is reported that a large part of the overflow orders from Ontario mills is swinging to Nova Scotia producers. Dominion Steel & Coal Corp. now reports full operations in most of its departments.

In order to make more steel available for war purposes, there has been sharp reduction in rolling of structural shapes, which now are down to 3000 tons per month for Canadian mills. It is further pointed out that a number of large construction jobs are being held up due to lack of shapes and the work will be held in abeyance until more ample supply is available.

Up to a few weeks ago considerable activity was reported in new plant and other construction projects, many of



# CONTINENTAL WIRE MADE TO SPECIAL SHAPES



**C**ONTINENTAL produces wire in many special shapes to fit manufacturer's requirements. Wire of special shape may add greatly to the appearance or quality of a product. Continental wire may be drawn to an intricate shape to fit into a special assembly or it may be drawn to a special shape to be used as a decorative molding.

Continental wire made to special shapes is available in a great variety of sizes and finishes. It has cut costs for many manufacturers. Even buyers of moderate size lots have realized substantial savings. You are invited to write or wire your requirements today.

CONTINENTAL STEEL CORPORATION • KOKOMO, INDIANA



# CONTINENTAL

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PRODUCERS OF—  
SHEETS: Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terme, etc.  
WIRE: Bright Basic, Annealed, KONIK, Coppered, Tinned, Special Manufacturer's, etc.



## SEMISILICA BRICKS

### DURATION OF HEAT AFFECTS REFRACTORIES

*Following statements are based on temperature range from 2200° F to 2700° F.*

#### SHORT DURATIONS OF HEAT

Furnaces with daily or shorter firing cycles usually require a good clay or super duty brick.

#### MODERATE DURATIONS OF HEAT

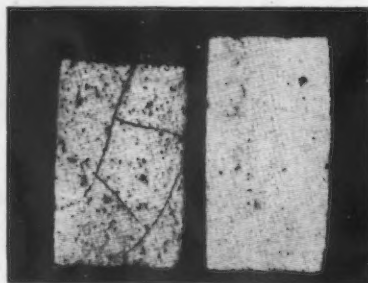
Furnaces with firing cycles of days, weeks or months require refractories which will not vitrify, shrink or spall, from the prolonged heats.

**RM SEMISILICA BRICKS** are made for this service. The picture at the right shows the results of 24 hours at 2650° F. on a First Quality Clay Brick and the almost unaffected RM.

#### LONG DURATIONS OF HEAT

Furnaces, intended to be run continuously can safely be lined with RM SEMISILICA BRICKS, provided the face temperature of the lining is below 2700° F. While silica bricks are ideal for continuous heats, a furnace may have to be shut down, which is hard on Silica Bricks, but RM SEMISILICA BRICKS take it easily.

*Note.* Some slags and gases attack refractories, so if in doubt, please ask or write for recommendation for your furnaces.



*Compression, vitrification and spalling of First Quality Clay Brick, and relatively unaffected RM Semisilica brick after a run of 24 hours under heat and load.*

#### In STEEL MILLS:

For Heating, Reheating, Annealing and Heat Treating Furnaces, OH Regenerators, Blast Furnace Stoves, Soaking Pits, etc. In the roofs, where spalling failure is most prevalent, they perform their greatest service.

#### In MANY INDUSTRIES:

Such as Chemical, Ceramic, Zinc Smelting and other industries where continuous heats in the temperature range of RM's are required for their processes.

**RICHARD C. REMMEY SON CO.**  
PHILADELPHIA 37, PA.

# REMMY

which have undertaken to give employment to workers let out of war plants and are in the line of postwar programs. However, this work has had to be abandoned and it is not likely to resume on a large scale until after the end of this year. Announcement was made early this year that civilian production of electric stoves, furnaces and various other civilian products would get underway about the middle of 1944. However, announcement from Ottawa during the week is to the effect that this program will be delayed and on furnaces only the most urgent needs will be filled.

The Steel Controller is making careful scrutiny of all new steel orders and mills are making delivery only against his approval. Pig iron continues in good supply with no shortage. There has been more basic iron moving between blast furnaces and steel mills recently to enable greater output of steel. Merchant melters in turn are being supplied on short notice and while rumors have been heard to the effect that pig iron again may be placed on the list of materials that must be approved by the Steel Controller before delivery is made, so far no action of this nature has taken place.

The steel situation in Canada, as a whole, is tight but how long this condition will last is anybody's guess. Already the government is scrutinizing war contracts, especially those held by subcontractors, with the object of revision wherever possible.

#### Technical and Trade Papers Go to Hospitalized Veterans Cleveland

• • • A program of re-education for war wounded veterans at Crile General Hospital, Cleveland, utilizing hundreds of business, technical and trade papers from current files of Cleveland advertising agencies has been announced by the Industrial Marketers of Cleveland. The periodicals are sought for the hospitalized convalescents and their value, if purchased, would be approximately \$60,000 per month, it was stated.

The cooperation of the 2500 advertising executives comprising the national membership in 28 chapters of N.I.A.A. scattered throughout the United States has been sought in an effort to keep supplies of current periodicals available to the hospitalized men. The plan will be national in scope and will be in effect nationally within a very short time.



**SOUND**

**STRONG**

**CASTINGS**

In car-building, the very function of steel castings—to carry the loads and take the shocks and impacts—is bound to put a premium on soundness and strength. That's where PSF's advanced foundry techniques, modern finishing facilities and constant laboratory supervision come into play. They're your best assurance of freedom from defects, improved grain structure, accuracy and stamina—the qualities in castings that spell service.

*Keep cars  
in Service*



W&D 9305

46 YEARS OF STEEL CASTING KNOWLEDGE

**Pittsburgh**  
**STEEL FOUNDRY CORPORATION**  
GLASSPORT, PA.

Sales Offices: NEW YORK • PHILADELPHIA • WASHINGTON AND CHICAGO

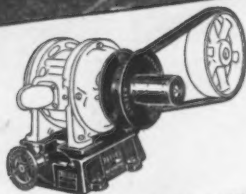
THE IRON AGE, July 6, 1944—147

# Industry's Preferred

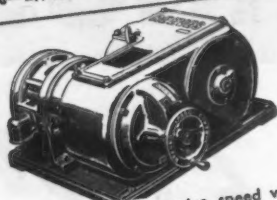
## METHOD OF SPEED CONTROL



**VARIABLE SPEED TRANSMISSION** for providing infinite, accurate speed flexibility over wide range—2:1 to 16:1. Sizes fractional to 87 h.p.



**VARI-SPEED MOTOR PULLEY** converts any standard constant speed motor to a variable speed drive with 4:1 ratio. Sizes to 15 h.p.



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**NEW CATALOG**  
This authoritative 128-page book on variable speed control describes the complete REEVES line of speed control equipment. Ask for Catalog-Manual IG.



● The definite preference of plant superintendents, machine shop foremen, and operators for REEVES Variable Speed Control is not hard to understand. No other speed control is so flexible, so infinitely variable, so positive and dependable in operation. No other offers so many types and sizes of units to meet every installation requirement. Get full information from Catalog offered above.

REEVES PULLEY COMPANY • COLUMBUS, INDIANA

*Accurate Variable*  
**REEVES  
SPEED CONTROL**

## National Tube Starts Production of Large Shells at McKeesport

**McKeesport, Pa.**

• • • Big 240 mm. shells for the Army's heavy fire mobile invasion guns soon will be flowing from new production lines at Christy Park Works of U. S. Steel's National Tube Co.

Measuring over nine inches in diameter, and weighing more than 300 pounds each, the shells will be the biggest ever produced at Christy Park, one of the first shell and bomb arsenals to supply munitions to the Allies in this war.

The new shop will produce the 240 mm. shells from solid round steel slugs in operations much the same as those at the plant which already has supplied the armed forces with more than 15,000,000 projectiles in the various sizes required by the Army and Navy. The shell steel will be shipped to Christy Park Works from affiliated National Tube mills, which already are meeting heavy orders from this and other shell manufacturers.

Equipment being installed includes two rotary type furnaces for heating the slugs, forging equipment, including a 1000-ton press, heat-treating furnaces and shell finishing lines. The building is being transplanted to McKeesport from National Tube's Ellwood Works at Ellwood City, Pa. The new installations will make Christy Park one of the nation's biggest producers of these shells for the Army's biggest mobile guns.

To meet changing needs for Army ordnance, the Christy Park plant recently converted some of its equipment to produce 8-in. shell forgings which are being shipped to other finishing plants.

## Bicycles Wait German Defeat

*Washington*

• • • Partially because the steel situation has become "extremely difficult" within the last 90 days, WPA has told members of the Bicycle Manufacturers Industry Advisory Committee that no large-scale resumption of bicycle production will be possible until after the war in Europe has been brought to a successful conclusion.

The tightening of the steel situation was attributed chiefly to increased military requirements and the manpower shortage. Referring to the copper situation, the board said that the big bottleneck is in the brass and wire mills.



# THESE Wickman PRINCIPLES

LAYOUT 50 TIMES THE SIZE OF  
PROFILE TO BE GROUND

50 TO 1  
PANTOGRAPH

30 POWER  
MICROSCOPE

CROSS HAIRS OF  
MICROSCOPE FO-  
CUS ON WORK AND  
GRINDING WHEEL.  
INTERSECTION OF  
CROSS HAIRS COR-  
RESPOND TO THE  
POSITION OF THE  
POINTER ON 50  
TIMES SIZE LAYOUT.

## Make Possible The ACCURATE GRINDING Of Profiles Such As These In Tungsten-Carbide Or Other Hard Metals

● The Wickman Profile Grinder has for a number of years proved exceptionally efficient for the grinding of irregular shaped contours on flat or circular form tools, male and female profile gages, punches, open and sectional die segments, etc.

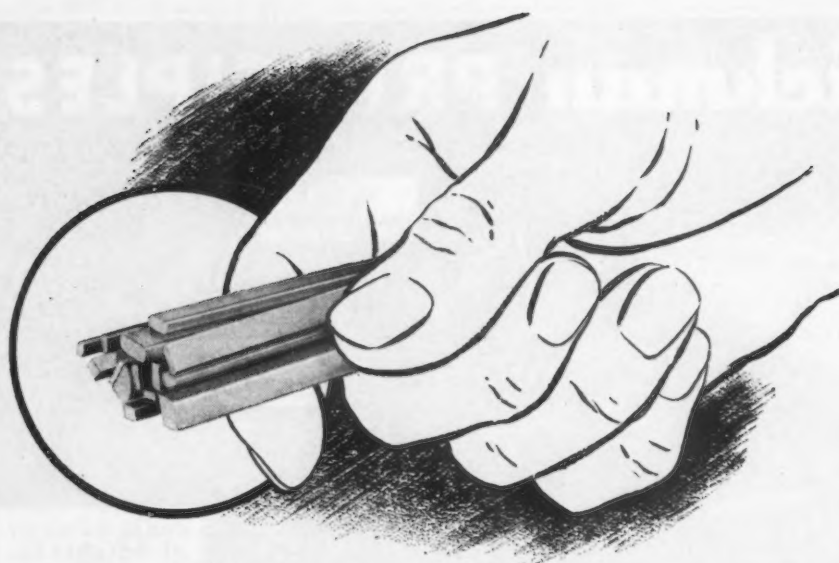
● Accuracy is held to within  $\pm .0005''$ . This accuracy is not affected by wheel wear and no special shapes or radius dresser need be used.

● Finished parts can be checked against the layout without removal from the machine. Reversing the operations followed in grinding, layouts can be made of parts having previously undetermined profiles.

*Literature Containing Full Information Is Yours for the Asking*

**THE Wickman**  
CORPORATION

15537 WOODROW WILSON AVE.  
DETROIT 3, MICHIGAN



# PAGE *Stainless Steel* WIRE

•If you are planning to use Stainless Steel Wire after re-conversion—GET IN TOUCH WITH PAGE.

Remember, wire has *always* been the business of PAGE. And, even in the earlier days of Stainless Steel, PAGE as a supplier of Stainless Wire learned much of its working qualities.

Then came the wide range of PAGE Shaped Wires—Hexagons, Octagons, Triangles, Key-stones, Ovals, Half-rounds—in section areas to



.250" square, and Rectangles and Flats in widths up to  $\frac{3}{8}$  inch.

All this activity brought more knowledge of the workability of Stainless Steel.

Then came 1941—and war—with a tremendous increase in the use of Stainless Steel that has made this entire organization perfectly at home with this product.

So, again! If you are planning to use Stainless Steel Wire after re-conversion, GET IN TOUCH WITH PAGE!

## PAGE STEEL AND WIRE DIVISION

Monessen, Pa., Atlanta, Chicago, Denver, Los Angeles,  
New York, Pittsburgh, Portland, San Francisco



*In Business for Your Safety*

**AMERICAN CHAIN & CABLE COMPANY, Inc.**  
BRIDGEPORT • CONNECTICUT

## NEWS OF INDUSTRY

### DPC Authorizes Contracts

Washington

••• Defense Plant Corp., RFC subsidiary, has authorized the following contracts:

Tube Reducing Corp., Wallington, N. J., to provide equipment at a plant in Wallington at a cost in excess of \$220,000.

Silica Products Oregon, Ltd., Portland, Ore., to provide additional plant facilities at Eugene, Ore., at a cost in excess of \$75,000, making a total commitment of more than \$130,000.

Mutual Chemical Co. of America, Baltimore, to provide equipment and machinery at a plant in Jersey City, N. J., at a cost in excess of \$75,000.

Watkins Motor Lines, Inc., Thomasville, Ga., to provide automotive equipment at a cost in excess of \$30,000.

American Cyanamide & Chemical Corp., New York, to provide additional facilities at a plant in Fort Worth, Tex., at a cost in excess of \$175,000, making a total commitment of more than \$3,750,000.

Maryland Sanitary Mfg. Co., Baltimore, to provide additional facilities at a plant in Baltimore, at a cost in excess of \$50,000, making a total commitment of more than \$2,175,000.

Lock Nut Corp. of America, Chicago, to provide additional equipment at a plant in Chicago at a cost in excess of \$80,000, making a total commitment of more than \$100,000.

General Motors Corp., Detroit, to provide plant facilities at Indianapolis at a cost in excess of \$700,000.

Monsanto Chemical Co., for construction of plant facilities at a plant in Springfield, Mass., at a cost in excess of \$400,000.

Atlantic Tubing & Rubber Co., Cranston, R. I., to provide equipment at a plant in Bellefont, R. I., at a cost in excess of \$450,000.

Clinton Products Co., Clinton, Iowa, to provide additional equipment at a plant in Clinton at a cost in excess of \$70,000, making a total commitment of more than \$340,000.

Bowser, Inc., Ft. Wayne, Ind., to provide equipment at a plant in Ft. Wayne, at a cost in excess of \$150,000.

Essex Rubber Co., Trenton, N. J., to provide equipment at a plant in Trenton at a cost in excess of \$125,000.

National Supply Co., Pittsburgh, to provide additional machinery and equipment at a plant in Torrance, Cal., at a cost in excess of \$145,000, making a total commitment of more than \$1,400,000.

Goodyear Aircraft Corp., Akron, Ohio, to provide additional facilities at a plant in Litchfield Park, Ariz., at a cost in excess of \$415,000, making a total commitment of more than \$9,260,000.

E. I. du Pont de Nemours & Co., to provide for the acquisition of additional equipment and plant expansion at Louisville at a cost in excess of \$4,000,000.

Republic Steel Corp., Cleveland, to provide additional equipment at a plant in Birmingham at a cost in excess of \$50,000, making a total commitment of more than \$2,460,000.

Eastman Kodak Co., Rochester, N. Y., to provide additional equipment at a plant in Rochester at a cost in excess of \$200,000, making a total commitment of more than \$625,000.

Acme Pattern & Tool Co., Inc., Dayton, Ohio, to provide equipment at a plant in Dayton at a cost in excess of \$215,000.

Monarch Aluminum Mfg. Co., Cleveland, to provide equipment at a plant in Cleveland at a cost in excess of \$145,000.

Monarch Rubber Co., Inc., Baltimore, Md., to provide equipment at a plant in Baltimore at a cost in excess of \$75,000.



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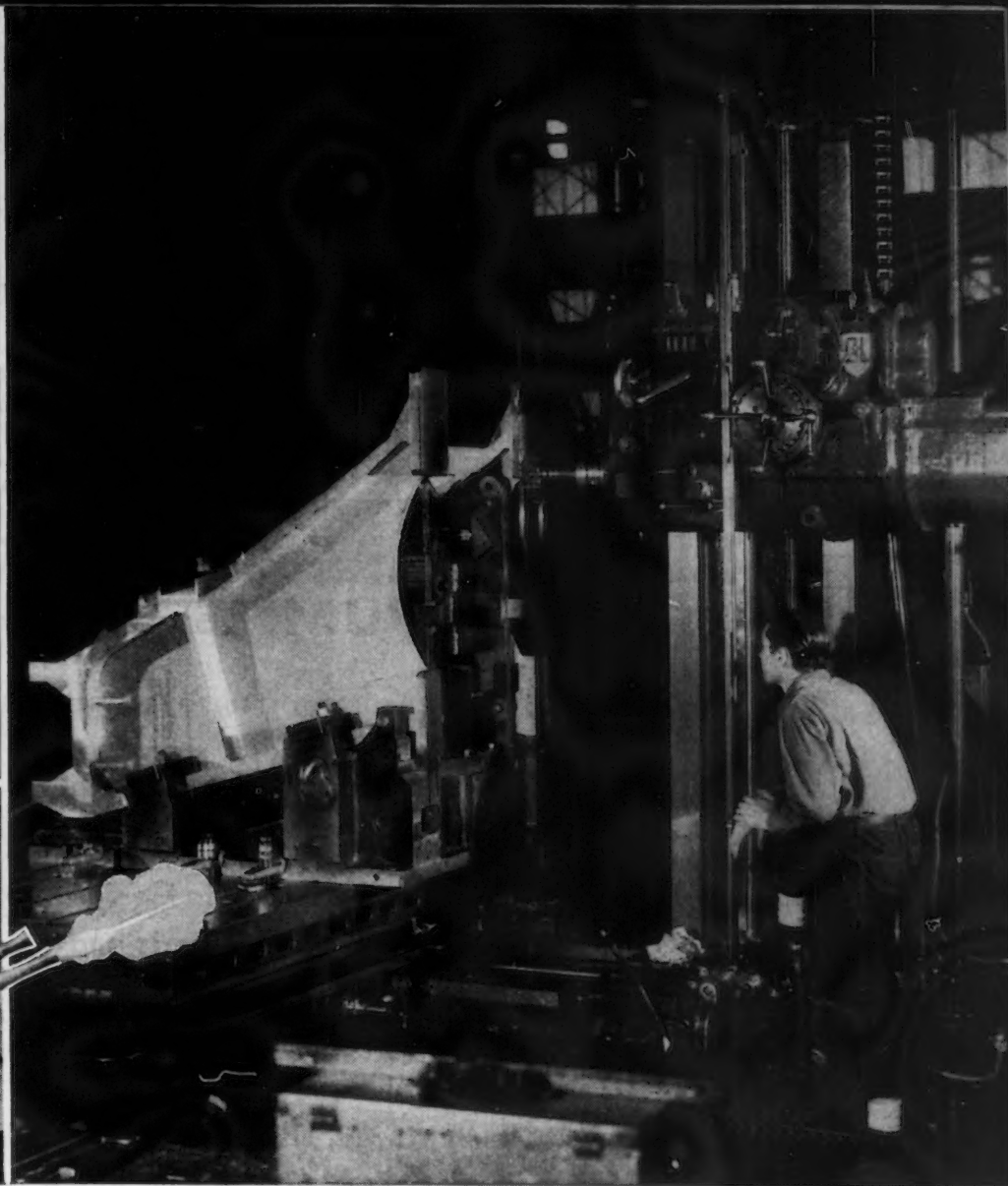
Cleveland, to  
Cleveland at

timore, Md.,  
in Baltimore

1932

1938

1944



## AN ADDED SERVICE TO THE RETOOLING OF AMERICA

When the day comes this company will have: Welding facilities for production of structures of any shape and any size within transportation limits. Machine tool facilities

to machine them. Engineering service skilled in machine design to assist you.

We will be glad to get in touch with you at any time.

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# DANLYWELD

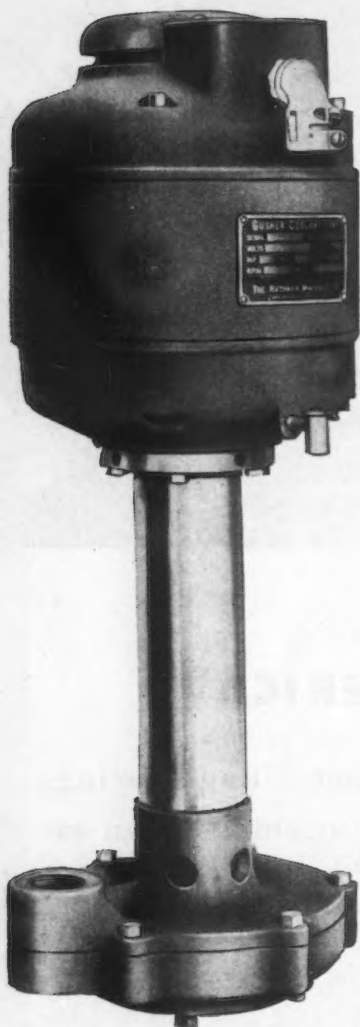
*Danly Die Sets • Die Makers' Supplies • Welded Steel Fabrication*

# Simplest Design

## MINIMUM MAINTENANCE

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## COOLANT PUMPS



Plant records of some of the country's largest factories show that Gusher Coolant Pumps require minimum maintenance. This is due to the simple design, with few parts and no bearings within pump itself, elimination of all packing nuts, no metal-to-metal contact, no relief valves. The result is less friction, less wear, longer life, minimum maintenance. From a dribble to 200 g.p.m., with no leakage—1/30 to 2 H.P., there is a Gusher model and type for your special needs.

**Write for catalog.**

**Model TL-7320**

See Section 2 of new catalog,

indexed for quick reference.

Gusher Pumps—Patented and Patents Pending

**THE RUTHMAN MACHINERY CO.**

1821 READING ROAD

CINCINNATI 2, OHIO

The "Gusher"—A Modern Pump for Modern Machine Tools

—FEATURE CONTINUATIONS—

### Platers Discuss Industrial Finishing Methods

(CONTINUED FROM PAGE 80)

composition of the bath have a marked and heretofore unappreciated effect on the size of the network or plateaus developed, and the principal element in this connection is the bath ratio; that is, the  $\text{CrO}_3/\text{SO}_4$  ratio. This must be closely controlled, because even rather narrow variations in this ratio will cause a significant variation in the size of the plateaus. Within limits, an increasing ratio causes an increase in plateau size.

The bath concentration has, within limits, little effect on the size of the network pattern or plateaus.

With the bath composition, the other principal control factor in the plating conditions is the bath temperature. In fact, for control of plateau size, temperature variations are even more critical than the bath composition; coordinated, they make the two principal control elements, the only other control variable, current density, having only a relatively small effect under the usual conditions of operation. Taking for example, the 125/1 ratio of chromic acid to  $\text{SO}_4$ , it can be noted that at 122 deg. F. the plateau size is relatively very fine, and on etching and honing a pitted or pin-point porosity is produced. Raising the temperature to 140 deg. F., keeping the same ratio and current density, gives a larger plateau size which, for the same amount of etching, produces a distinct network or channel type porosity on honing. The intermediate temperature of 130 deg. F. results in a modified channel type porosity.

While the same porosity result can be produced by various coordinations of the control elements, actual practice has more or less standardized on two sets of conditions, one for the pitted or pin-point type porosity, and the other for the network or channel type porosity. In both cases a 250 grams per liter  $\text{CrO}_3$  bath is usually used, and a current density of 3 to 3½ amp. per sq. in. For the pitted type porosity, a temperature of 122 deg. F. and a bath ratio of 100 to 1 to 125 to 1 ( $\text{CrO}_3/\text{SO}_4$ ) are employed. For the network or channel type porosity, a temperature of 140 deg. F. and a bath ratio of 115 to 1 to 125 to 1 ( $\text{CrO}_3/\text{SO}_4$ ) are used. The temperature is maintained within ±1 deg. F., preferably ±½ deg. F. and the  $\text{CrO}_3/\text{SO}_4$  ratio is kept as close as pos-





Removal of sheet stock from incoming cars

is first step in

*Fast moving*

## MATERIAL HANDLING SYSTEM

● The employment of "AUTOMATIC" Tiering Fork Trucks in handling sheet stock from its arrival through various processes of manufacture is a definite answer to efficiency as well as low costs.

Sheet stock is quickly unloaded from the box cars, taken directly to storage and tiered by the "AUTOMATIC," thereby eliminating needless handling and delay. Ceiling space

is utilized, and high, orderly stacks are quickly and easily accessible.

Thus the continuous flow of materials, made possible by "AUTOMATIC" Tiering Fork Trucks, insures fast, low-cost, daily handling which helps materially to speed up operations.

. . . Find out just how you can apply the "AUTOMATIC" Tiering Fork Truck to your handling needs — write today.



MANUFACTURERS FOR OVER THIRTY FIVE YEARS *Electric Propelled* INDUSTRIAL TRUCKS

**AUTOMATIC TRANSPORTATION CO.**

**75 WEST 87th STREET**

DIV. OF THE YALE & TOWNE MFG. CO.

**CHICAGO 20, ILLINOIS**

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## ON ALL TYPES OF ELECTRO PLATING

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**LARGE CAPACITY NOW  
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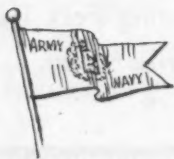
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EAST BOSTON 28, MASS.

“99”

*Just one year shy of  
a century of springmaking...and believe us,  
we've seen a lot of life...panics...wars...boom  
times...bum times...but we believe in our  
country and our cause...and we stick to  
our knitting because we want to be*

*“Everybody's Spring Dept.”*



**DUNBAR**

**BROTHERS CO.**

DIV. OF ASSOCIATED SPRING CORP.

**BRISTOL, CONN.**

**SPRINGS • WIRE FORMS • SMALL STAMPINGS**

## FEATURE CONTINUATIONS

sible to the selected value, by means of frequent bath adjustments based on periodic analyses.

With the chromium properly deposited as to required thickness and correct predisposition, the next step is etching. The extent of this etching is important with respect to control of not only depth and degree of porosity, but also type.

With the pitted or pin-point type porosity the extent of etching is not very critical, as to type of porosity, beyond the first slight amount of etching. Control of the extent of etching is of real consequence however. While the maximum depth of porosity (generally about 0.003 to 0.004 in.) is of general concern, there is the important application to piston rings where only a limited depth of porosity is desired, from 0.0005 in. to 0.0015 in. and little or no finishing after etching is practised.

Porosity in a predisposed deposit may be produced by a straight chemical etch, or an electrochemical etch done with applied current, or a combination of both.

### Hydrochloric Etch

Among the straight chemical etches or strips for chromium is hydrochloric (muriatic) acid, which is very effective, though not too easy to use. It is difficult, if not impossible, to tell the porous plate etched in hydrochloric acid, from a porous plate produced by anodic etching in chromic acid.

The anodic electrochemical etching method is the chromic acid solution with or without sulphate. The extent of etching is a function of the current and time, and is usually measured in terms of amp.-min. per sq. in. In usual practice, the chromic acid etching bath is operated at the same temperature as the plating bath, and at a current density of 2 to 4 amp. per sq. in.

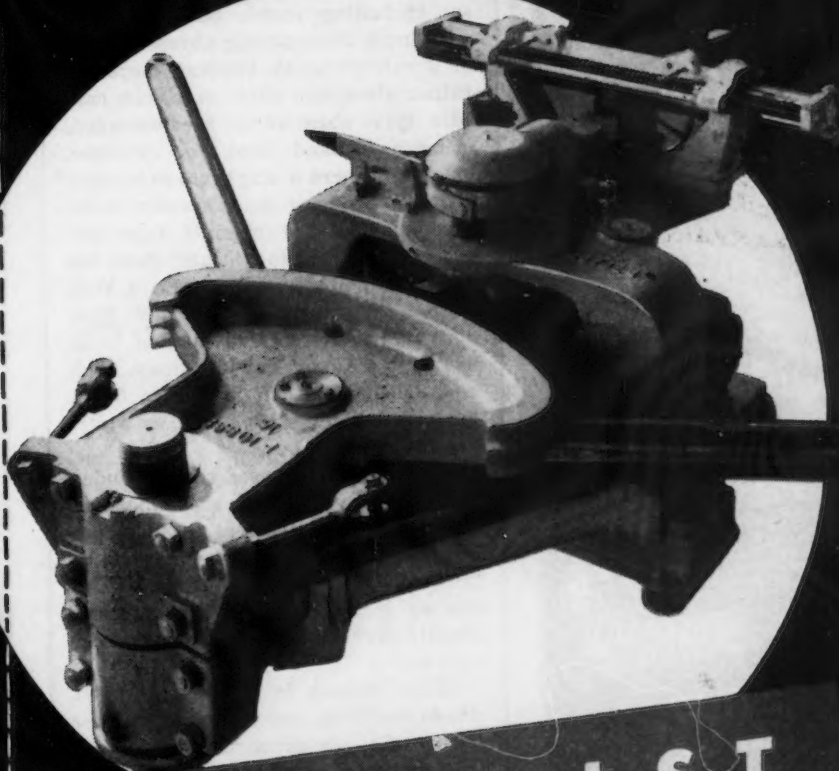
The composition of the chromic acid etching solution is not critical with respect to concentration, content, temperature or current density. The etching bath is maintained sulphate-free preferably; that is, plain chromic acid, for the practical purpose of avoiding deposition of chromium on the cathode member of the fixture.

Porosity can also be produced electrochemically by cathodic treatment in any number of electrolytes; hydrochloric, sulphuric, phosphoric, and oxalic acids, and acid and acid-salt mixtures.

The finishing method most commonly used on cylinder bores is hon-



BALDWIN-BUILT  
STEERING GEAR



**STANDARD with the L.S.T.**

Standard Steel Forgings and Castings have found more than one part to play in World War II. Most recent and critically important are the steering gears on L.S.T.'s now in operation by the U. S. Navy.

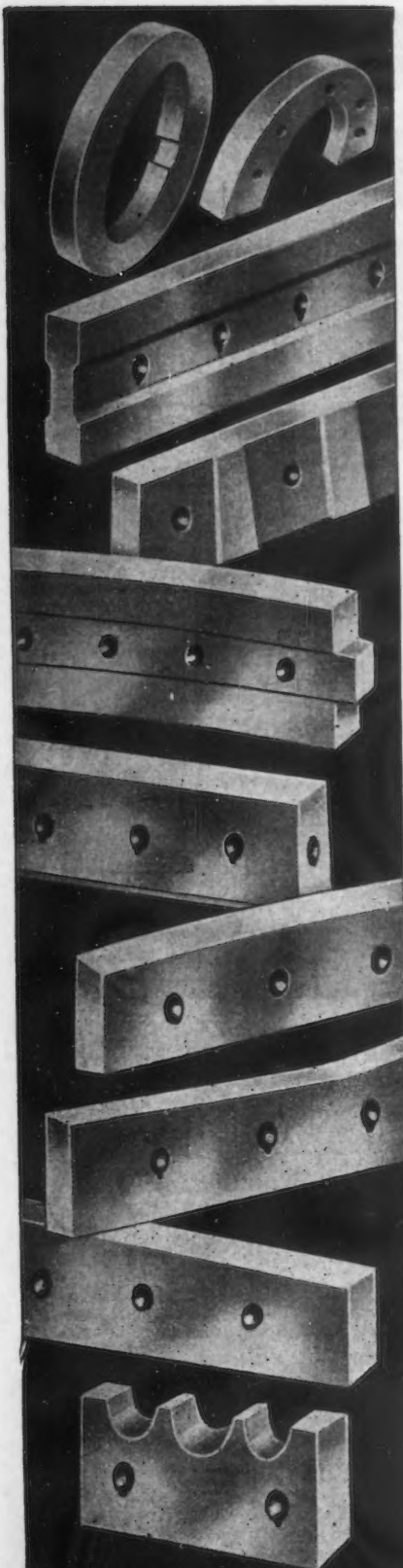
Many of the steel forgings and castings in these specially designed quadrant steering gears are products of Standard Steel.

The Baldwin Locomotive Works, Standard Steel Works Division, Burnham, Pa., U.S.A. Offices: Philadelphia, New York, Washington, Boston, Cleveland, Chicago, St. Louis, Houston, San Francisco.



**BALDWIN**  
**STANDARD**

**STEEL FORGINGS & CASTINGS**



Greater Tonnage  
Per Edge of Blade



**AMERICAN**  
**SHEAR KNIFE CO.**  
HOMESTEAD · PENNSYLVANIA

## FEATURE CONTINUATIONS

ing. It can be done with a single set of honing stones made up of a very hard, fast-cutting abrasive, held in a soft or weak bonding material. Either aluminum oxide or silicon carbide type abrasive is recommended, using a resinoid bond, for example, bakelite. Where a single stone is used, about a 400 grit is generally to be recommended for channel type porosity, and a 180 to 240 grit stone for pin-point porosity. To obtain a high degree of finish for channel type porosity, the preferred method is to use first a faster cutting stone, such as a 280 or 320 grit, and then finish up with a finer stone, such as a 500 or 600 grit.

Generally, high-speed cutting under low pressure is to be recommended. On finishing, the lightest possible cuts are taken, with the stone allowed to "run-out" in the final passes. The honing is done wet, with kerosene usually serving as the cutting oil and coolant.

While honing is to be preferred where facilities are available, polishing of the porous chromium deposit is also satisfactory. In the case of diesel liners, especially, some of these are of such size that proper hones are not readily available. In this case, stitched cloth wheels set up with the proper grades of emery are used.

Lapping is a satisfactory method for finishing porous chromium deposits, under some conditions. It is used quite generally on piston rings, sometimes in conjunction with a preliminary sanding or brushing operation to remove any loose "chalk" or "crust" left from the etching treatment.

The lapping of the rings is done in a dummy cylinder, charged with lapping compound, such as diamond dust in oil. Just a few passes are sufficient, generally, to give a ring-face surface that will pass the light-tight test.

### Removing Abrasive Debris

The method of removing the honing debris is to wash it out of the pores with a solvent vapor blast, using high pressure air; or with hot alkali, using live steam. Air (or steam) under pressure picks up solvent (or cleaner) from a suitable container, and with the nozzle held within  $\frac{1}{2}$  in. or  $\frac{3}{4}$  in. of the cylinder wall, and perpendicular to it, blasts the debris from the pores. The cylinder is rotated while the nozzle is lowered and raised at such a rate to insure every point on the cylinder surface being hit by the blast of solvent or cleaner.



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## FEATURE CONTINUATIONS

The racks used are the same as those which would be used in regular hard plating where a relatively thick deposit of chromium must be uniformly applied. To obtain proper distribution of plate, the author utilizes the usual devices of careful anode spacing, stop-offs on either or both the work and anode, and guards, shields or extension collars, all of which are familiar to the experienced hard chromium plater.

Conforming anodes are generally used. With the piston rings, the anode is a hollow cylinder, permanently located in the tank with about a 2 in. anode to cathode spacing. With both diesel engine liners and aircraft cylinders, the work holding member and the cylindrical inside anode are combined into a single composite fixture.

With the electrolytic etching, either cathodic or anodic, the same general type of fixture as used in plating is employed.

Rack maintenance is very important, and is given good attention wherever this work is done. Contacts, spacing tolerances and alignment, all are continually checked and kept as they should be kept.

In the technique for porous chromium plating, cleaning methods prior to plating are essentially the same as for hard chrome plating.

It is quite impossible to give a single, comprehensive outline of operations applying to the widely different porous chromium applications. Nevertheless a typical cycle for an aircraft cylinder is as follows:

1. Unpack.
2. Vapor degrease.
3. Inspect; take bore-check.
4. Apply stop-off and trim.
5. Pumice scrub, using alkali and tampico wheel.
6. Rinse.
7. Rack, and affix shields, extension collars, etc.
8. Clean by anodic etch in chromic acid.
9. Plate.
10. Bore check.
11. Etch the plate.
12. Unrack.
13. Remove stop-off.
14. Bore-check.
15. Hone.
16. Bore-check.
17. Degrease.
18. Clean porosity.
19. Inspect.
20. Paint outside.
21. Pack and ship.

(TO BE CONTINUED NEXT WEEK)

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# MACHINE TOOLS

... News and Market Activities

## Report on Old DPC Tools Challenged

### Cleveland

• • • Refuting the statement made recently in *THE IRON AGE* that many of the government owned machine tools being reported idle and surplus by war contractors are excessively old, a government official here states that most DPC owned tools are not more than three to four years old.

This statement would seem logical in that the DPC did not begin buying until 1940, placing the oldest purchase at about four years ago, but it still does not check with the reports of dealers whose business it is to know the condition of contract producers' facilities. The dealers point out that when the government first started to purchase tools for war work the machine tool industry was not equipped to turn out the vast quantities of tools needed. To fill the gap, the DPC is thought to have bought up quantities of existing equipment in shops regardless of age or condition.

It is pointed out in this regard that plants now being compelled to report all machine tools that fall into this idle and excess category are quite naturally reporting the oldest and most seriously abused machines first in the hope that they may later purchase the better DPC equipment, in which they now hold a sizeable equity.

While there appears to be no proof of the statement either way, it is safe to scrutinize the government offerings closely with especial eye to the age and condition after the months of war time service of any machines listed.

A high percentage of the government owned machine tools turning up through this reporting are said to be of a highly specialized nature, many suitable only to ammunition production. Considering the emphasis on heavy shell and ammunition it would be expected that these would fit right into current programs. The specialized nature and size of many are said, however, to make them unsuitable for most present requirements, which are for larger shells.

In discussing the prospects for a greatly increased quantity of machine tools coming on the market as idle and excess, it was pointed out that impending cutbacks and model changes brought about by the course of the war would bring about a marked but unpredictable increase.

Some hesitancy on the part of contractors about reporting machine tools promptly is thought to result from the wish to be certain that the government was serious about doing something with the report after it was compiled.

## "War Reserve" Plan Will Store Machine Tools

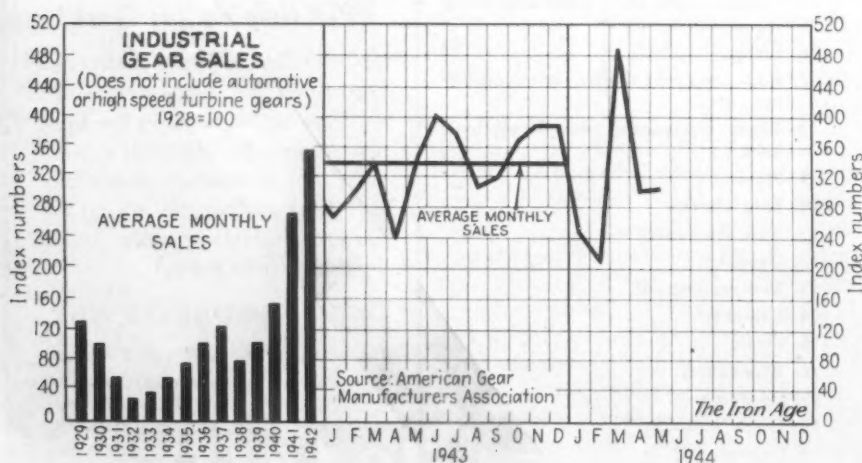
### Cleveland

• • • Postwar worried machine tool builders will be glad to know that the military services are forming plans to establish a "war reserve" of machine tools at the close of this war or as soon as cutbacks seriously affect industry.

Present thinking is that the outcome of the heavy artillery program will indicate as early as Aug. 15 just which tools will be safe to set aside as a war reserve. It is planned then that selected machine tools of both a general purpose and specialized nature will be stored in temporary warehouses.

In case of further war emergencies these machine tools can be drawn on for production, it is understood, but eventually will go to permanent storage in warehouses at various arsenals. This may be as late as two years after the war. The tools will not go into storage for modernization of arsenals, as they are believed to be well equipped now. The plan is said to cover all machine tools needed by the Army Service Forces and the Navy.

## May Gear Sales Show Little Change



... The gearing industry as represented by the members of the American Gear Manufacturers Association shows an increase of  $\frac{3}{4}$  of 1 per cent in the business booked in May, as compared with April. The May index figure was 305.

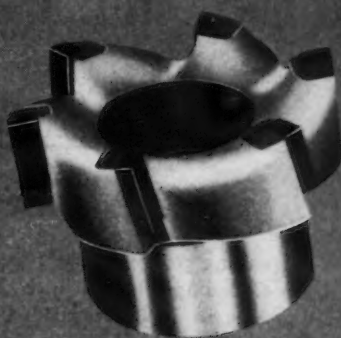
## AA-5 Set as Lowest Rating For Machine Tool Orders

### Washington

• • • General preference order E-1-b as amended by the WPB on June 22 raises the lowest rating acceptable on an order for a machine tool from A-10 to AA-5 to conform to existing WPB policy. All valid forms of preference ratings may now be used. The revised order provides that until Sept. 1, each producer is to maintain his schedules as established on June 22.

The amended order also permits a producer of machine tools who has filled all rated orders to deliver a total of not more than 10 machines among his various dealers, but the latter may resell the machine only on a rating of AA-5 or better. It is no longer necessary for the purchaser to supply a certified or photostatic copy of the preference rating certificate to the machine tool builder.





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1. On one straddle milling job in 4140 SAE steel, 40-43 Rockwell Hardness, the HSS cutters were operated at a surface speed of 50 FPM. With Super Carbide Tipped cutters the surface speed was stepped up to 300 FPM. On this same job, the table feed was increased from  $\frac{7}{8}$ " per minute to  $7\frac{1}{2}$ " per minute. Other economies resulted through an increase from 90 pieces per grind to 216 pieces per grind. And in addition, with the Super Milling Cutters the job was run dry and the floor to floor time per piece was reduced from 30 minutes to 10 minutes.
2. On an end milling job on a steel forging a HSS cutter was operating at 80 RPM with a table feed of  $3\frac{5}{8}$ " per minute. When a Super Carbide-Tipped Shell End Mill was used, the RPMs were stepped up to 415 and the table feed increased to  $12\frac{1}{8}$ ". In addition the Super Cutter produced 90 pieces per grind as compared with 60 with the HSS cutter.

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# NON-FERROUS METALS

... News and Market Activities

## Postwar Lead Demand to Raise Price

... Consumption of the three basic non-ferrous metals, copper, lead and zinc, has increased in the past century to a pace that cannot be continued without exhausting the world's supplies, said Clinton H. Crane, president, St. Joseph Lead Co., in a recent address to the Mining Club of New York.

The lead mine production of the world has increased from a 1.25 million tons in 1913 to nearly 2 million tons in 1938, the last year for which statistics are available. Yet lead production in the United States during the past 30 years has varied from a low of 277,000 tons in 1932 to a high of 688,000 tons in 1929. These tonnages do not include returned lead scrap. In general, production here and elsewhere has varied with the price, Mr. Crane said. The lowest average yearly price for lead was 3.2c. per lb. in 1932; the highest, 9c. per lb. in 1925. World War I was fought with a controlled lead price in the United States of 8.05c.; World War II, with

a ceiling price of 6.5c. per lb.

Consumption of lead by the United States in 1943 was 1,126,000 tons, of which roughly 820,000 tons came from mine production and scrap. The balance was imported. It will be seen from the table of lead consumption classified by application that while a good many are war uses of lead, many peacetime uses have been curtailed. In order to supply normal postwar demands, it is safe to say that lead must be imported and that a higher price must be paid for it than in prewar times. Moreover, if Europe uses as much lead as it did normally, 500,000 tons must be imported into Europe.

There is no question but that it will be necessary to go farther afield to supply requirements of lead and zinc, and this will involve higher prices to compensate for increased transportation costs. Although the ceiling price for lead has been established at 6.5c. a lb. the average price paid for all lead mined in the United States dur-

ing the last half of 1943 was over 7.5c. a lb.; 103,000 tons were produced at a price of 8.1c. and 17,000 tons were produced at 9.75c. a lb. With out the premium price plan established to bring into production marginal and sub-marginal mines without increasing the general price level, less than 90,000 tons would have been produced for the half year.

In 1913 there were four major uses of lead in the United States. White lead claimed 30 per cent of production; the balance divided among metal, antimonial lead, and oxides. The total lead accounted for was 437,000 tons. Over the past 20 years, white lead has given way in importance to cable covering, storage batteries, tetraethyl lead for improving the octane rating of gasoline, red lead and litharge, even pipe, sheet and caulking. But total consumption has jumped nearly 300 per cent.

## Tin Recovery

... The recovery of tin from the salvage of used cans in 1943 is estimated by the American Bureau of Metal Statistics in its yearbook for 1942-43, recently published, to have amounted to 1800 long tons. This represents approximately 50 per cent of the total production of 3800 tons of tin by detinners in 1943, the balance being largely tin plate clippings from the manufacture of new tin cans.

## Magnesium

... Raw materials for the production of magnesium metal, basic refractories, and other essential magnesium compounds were produced in greater quantities in 1943 according to the Bureau of Mines. These included magnesite, brucite, dolomite, sea water, sea water bitterns and well brines. The mine output of crude magnesite reached the record quantity of 754,832 short tons valued at \$6,071,596, compared with 497,368 tons valued at \$3,874,334 in 1942. Production of magnesium metal in excess of the rated capacity of 9 1/3 million lb. per month by Basic Magnesium, Inc., Las Vegas, Nev., accounted largely for the tremendous increase in production of magnesite in 1943, the Bureau reported.

Consumption of Lead by Classes of Products\* Net Tons  
(Including primary and secondary pig lead and lead in alloys)

	1942	1943	1917 <sup>3</sup>
Storage batteries.....	180,602 <sup>1</sup>	256,851	44,000
Ammunition.....	91,412	178,472	44,000
Cable covering.....	183,468	144,932	75,000
Red lead and litharge.....	125,921	92,355	13,300
Tetra-ethyl lead.....	50,842	62,602	
White lead and other pigments.....	74,732	61,834	98,000
Pipe, sheet and caulking.....	77,727	62,557	75,000
Solder.....	33,679	39,468	14,000
Babbitt and bearing metal.....	19,903	33,453	26,000
Brass and bronze.....	24,900	25,415	1,500
Collapsible tubes.....	17,862	19,144	
Chemicals and insecticides.....	18,835	15,476	
Foil.....	6,056	12,858	21,000
Type metal.....	12,547	11,702	5,000
Weights and ballast.....	4,031	9,731	
Terne metal.....	6,044	3,285	
Heat treating and annealing.....	3,836	4,390	
Seals, nails and washers.....	2,025	1,564	900
All other and unclassified <sup>2</sup> .....	114,800	89,912	96,300
Total.....	1,049,222	1,126,001	514,000

\* Source: Tin-Lead Division, WPB.

<sup>1</sup> In 1943 part of red lead and litharge figures shown above as reported should properly be classified with storage batteries: probably total consumption in storage batteries during 1942 about 220,000 tons.

<sup>2</sup> Includes items such as lead castings, lead wool, wire coating miscellaneous alloys, maintenance repairs, lead coated sheets, lead powder and anodes for years 1942, 1943. For year 1917 includes 29,500 as pig lead retained in less than carload lots, 18,000 as other white metals, 11,700 as miscellaneous blue lead products, and 36,800 as miscellaneous oxides.

<sup>3</sup> War Industries Board.



## NON-FERROUS METALS

### REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	12.00
Aluminum, deoxidizing grades	11.00 to 12.25
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5 ingots (No. 115)	13.00
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	\$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be.	\$15.00
Gold, U. S. Treas., dollars per oz.	\$35.00
Indium, 99.5%, dollars per troy oz.	\$7.50
Iridium, dollars per troy oz.	\$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	\$191 to \$193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	\$24.00
Platinum, dollars per oz.	\$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

### Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.37	20.37	
Copper, H.R.		17.37	
Copper, drawn		18.37	
Low brass, 80%		20.40	20.15
High brass			19.48
Red brass, 85%		20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut		15.01	
Commercial bronze, 90%		21.32	21.07
Commercial bronze, 95%		21.53	21.28
Manganese bronze	24.00		28.00
Phos. bronze, A, B, 5%		36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympe or equal		25.50	26.00
Nickel silver, 5%		28.75	26.50
Architect bronze	19.12		

### Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

**Tubing:** 2 in. O.D. x 0.065 in. wall 2S, 40c. (1/2 H); 52S, 61c. (O); 24S, 67 1/2 c. (T).

**Plate:** 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

**Flat Sheet:** 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

**Extruded Shapes:** "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28 1/2 c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

**Wire Rod and Bar:** Base price; 17ST and 11ST-3, screw machine stock. Rounds: 1/4 in., 28 1/2 c. per lb.; 1/2 in., 26c.; 1 in., 24 1/2 c.; 2 in., 23c. Hexagonals: 1/4 in., 34 1/2 c. per lb.; 1/2 in., 28 1/2 c.; 1 in., 25 1/2 c.; 2 in., 25 1/2 c. 2S, as fabricated, random or standard lengths, 1/4 in., 24c. per lb.; 1/2 in., 25c.; 1 in., 24c.; 2 in.,

23c. 24ST, rectangles and squares, random or standard lengths, 0.093-0.137 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27 1/2 c.

### NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

#### Copper, Copper Base Alloys

##### OPA Group 1

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

##### OPA Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gliding metal turnings	8.50
Contaminated glided metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

##### OPA Group 3

Yellow brass soft sheet clippings	8.625
Yellow red brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25 <sup>1</sup>
Manganese bronze solids	6.25 <sup>2</sup>
Manganese bronze borings	6.50 <sup>1</sup>
Manganese bronze borings	5.50 <sup>2</sup>

##### OPA Group 4

Automobile radiators	7.00
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##### OPA Group 5

Refinery brass	5.00*
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\*Price varies with analysis. <sup>1</sup>Lead content 0.00 to 0.40 per cent. <sup>2</sup>Lead content 0.41 to 1.00 per cent.

#### Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

### ELECTROPLATING ANODES AND CHEMICALS

#### Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25 1/2
Electrolytic, full size	22 1/2
cut to size	30 1/2
Rolled, oval, straight, 15 in. and longer	23 1/2
Curved	24 1/2
Brass: Cast, 82-20, elliptical, 15 in. and longer	23 1/2
Zinc: Cast, 99.99, 16 in. and over	16 1/4
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

#### Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

#### Aluminum

##### Plant scrap, segregated

All S-type alloys (except 2S)	8.50
2S solids	8.00
High grade alloys	7.00
Low grade alloys	6.50
Borings and turnings	
High grade alloys	5.50
Low grade alloys	5.00

##### Plant scrap, mixed

All solids	6.00
Borings and turnings	4.00

##### Obsolete scrap

Pure cable	8.00
Old sheet and utensils	7.00
Old castings and forgings	6.50
Pistons, free of struts	6.50
Pistons, with struts	4.50
Old alloy sheet	5.50

For old castings and forgings, pistons, sheets, add 1/4 c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1 1/2 c. a lb.

#### Magnesium

##### Segregated plant scrap

Pure solids and all other solids, exempt Boring and turnings	8.00
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##### Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

#### Zinc

New zinc clippings, trimmings	7.25
Engravers' lithographers plates	7.25
Old zinc scrap	5.75
Unsweetened zinc dross	5.80
Die cast slab	5.80
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

#### Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

#### Nickel

Ni content 98+%, Cu under 1/4%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

#### Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82-41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc sulphate, 89% crystals, bbls.	6.80

## Institute Holds Midyear Meeting

### Pittsburgh

••• Convening at Pittsburgh on June 28 and 29, the Institute of Iron and Steel Scrap, Inc., at its midyear business meeting, discussed mainly the business the postwar aspects of scrap. Heretofore, considerable scrap has been culled over for salvage and usable materials, but under current government rulings there has been strict regulations that all material sold by government agencies as scrap should be thoroughly scrapped, and none of such material could be salvaged or reclaimed.

The board of directors of the institute endorsed the inclusion of a warranty clause in contracts covering this matter for the duration of the war only. When surplus or excess materials are sold by government agencies and purchased by the dealers as scrap, they accordingly shall be sold only as scrap. However, it is the intention of the scrap dealers to keep the door open for salvage and reclamation procedures after the war.

It might be noted that the clause only refers to contracts through to the end of the war. With the termination of the war, scrap dealers and yard operators wish to be free to handle scrap as they see fit. However, with the end of the war will not necessarily come the end of disposition of surplus and excess materials that are sold as scrap. In fact, it is quite obvious that a large part of surplus property disposal might come after the conclusion of the war.

The alloy committee of the institute urged a closer relationship between consumers, producers, and dealers, and pointed to the fact that the WPB 10 ton small producer exemption clause on segregation of alloy turnings has caused considerable difficulty and has been one of the chief causes of alloy scrap contamination. While the Institute had previously recommended elimination of the provision, nothing as yet has been done about it. It was pointed out that such small pickups (10 tons or less per month) in themselves do not seriously affect the market, their cumulative contaminating effect is serious, especially now when supplies of alloy turnings is so heavy.

Yard dealers meeting in Pittsburgh

considered the seriousness of the manpower situation in relation to the monthly reporting requirements of WPB on scrap. It was recommended that instead of the "individual transaction" type of report required by WPB each month, a "summary" type of report be inaugurated, thus cut-

## Convention Scheduled For Cincinnati On Jan. 10 and 11, 1945

### Pittsburgh

••• The Institute of Scrap Iron and Steel, Inc., at its mid-year meeting in Pittsburgh on June 28 and 29, selected Cincinnati as the city for its 17th annual convention. The convention will be held on Jan. 10 and 11, 1945, at which time officers for the subsequent business year will be elected.

The Institute of Iron and Steel Scrap, Inc., at its Pittsburgh meeting extended the term of office of Edwin C. Barringer as Executive Secretary to Dec. 31, 1946. Mr. Barringer is also president of the Institute.

ting down considerably on the clerical help necessary to handle these matters.

PITTSBURGH—Scrap buying in this area is quite selective, but both demand and supply are in good balance. There is no particular fear of future shortages of scrap by either dealers or consumers. The greatest anxiety of the yard operators is the manpower problem. Current WPB warnings of scrap shortages are falling pretty much on dead ears, because neither dealers nor consumers care to be caught at the end of the war with large inventories.

CHICAGO—Despite continued cautious mill buying, with notable exceptions, it is now generally conceded that the price structure in this district is safe from any immediate assault. Ceiling prices are firmly established on the better open hearth grades, and balers appear disposed to offer prices sufficient to attract desirable machine shop turnings. Establishment of the market on blast furnace grades awaits the emergence into the open of transactions confirming a slightly higher level, although it appears extremely doubtful that ceiling prices again will be touched.

CLEVELAND—Blast furnace borings and turnings are still finding a ready market here. A major consumer received one boat load downlake last week and anticipates at least two more soon. Other demand has been very poor with even heavy melting finding slow going on local demand. Some out of town shipments have kept scrap moving but close buying and controlled stock piles have held buying to the level of operating needs only. Buyers are very inventory conscious. Collections are sluggish and manpower has kept preparation at a low level.

BOSTON — Not much business was transacted the past week. Excessive heat had something to do with it, but common complaint is that it grows progressively harder to do business with mills on material available, notably turnings, while supply of desirable grades like heavy steel and cast iron are more difficult to obtain. Railroads say if it were not for shipyard scrap they would be handling little material for points outside New England. Truck movement of scrap to nearby foundries holds up fairly well.

PHILADELPHIA—There has been little change in the scrap situation this week. Although shipments are going to the consumers, no user has made any commitments for July. While mills are frankly stating that they desire to reduce their inventories, they have not given any indication that they are holding out for reduced prices. It seems unlikely here at the present that open hearth grades, No. 1, No. 2 and bundles, will be sold under ceiling. However, turnings continue to be sold at \$1.25 under OPA prices and the low phos market appears to be getting even weaker. With the tight pig iron supply, cast remains in excellent demand.

BUFFALO—Beset by hot weather and scanty manpower, dealers are coasting along while mills continue to receive heavy shipments of open hearth scrap by barge canal. Reports are current that whole tanks, knocked out in battle, are scheduled for loading in New York for canal delivery in Buffalo. If so, these machines will have to be cut down in the receiver's own yards as operators now require five to six months to clear unprepared scrap against a time limit of 90 days when workers were plentiful. It is doubtful any local dealer would undertake such a job. Meanwhile, no sales of turnings in quantity are reported, the principal consumer holding out for \$12.50 with no offerings at that price.

BIRMINGHAM — Mills in this area, still buying open hearth scrap on a restricted freight rate basis, are further restricting purchases to current needs. Blast furnace grades remain in demand but no market exists for electric furnace and foundry grades.



# IRON AND STEEL (OTHER THAN RAILROAD) SCRAP

(All Prices Are Per Gross Ton)

ELECTRIC FURNACE, ACID OPEN HEARTH AND FOUNDRY GRADES

	BASIC OPEN HEARTH GRADES		BLAST FURNACE GRADES				Low Phos.		Heavy Structural and Plate			Foundry Steel				Alloy Free Low Phos. and Sulphur Turnings	Heavy Axle Forge Turn. First Cut	Electric Furnace Bundles
	No. 1 & 2 Hyv. Melt. No. 1 Cp. Bk. Shts. No. 1 & 2 Busheling	Unbaled* Machine Shop Turnings	Mixed Borings and Turnings	Cast Iron Borings	Shovelling Turnings	No. 2 Busheling	Bar Crops, Punchings Plate Scrap and Cast Steel	Billet, Bloom, Forge Crops	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Auto. Springs, and Crank-shafts				
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton.....	\$20.00	\$15.00	\$15.00	\$16.00	\$17.00	\$17.50	\$25.00	\$22.50	\$21.50	\$22.00	\$22.50	\$21.50	\$22.00	\$21.00	\$18.00	\$19.50	\$21.00	
Cleveland, Middletown, Cincinnati, Portsmouth.....	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50	
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point..	18.75	13.75	13.75	14.75	15.75	16.25	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	19.75	
Ashland, Ky.....	19.50	14.50	14.50	15.50	16.50	17.00	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	20.50	
Buffalo, N. Y.....	19.25	14.25	14.25	15.25	16.25	16.75	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	20.25	
Bethlehem, Pa.; Kokomo, Ind....	18.25	13.25	13.25	14.25	15.25	15.75	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	19.25	
Duluth, Minn.....	18.00	13.00	13.00	14.00	15.00	15.50	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	19.00	
Detroit, Mich.....	17.85	12.85	12.85	13.85	14.85	15.35	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	18.85	
Toledo, Ohio.....	17.50	12.85	12.85	13.85	14.85	15.35	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50	
St. Louis, Mo.....	17.50	12.50	12.50	13.50	14.50	15.00	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	18.50	
Atlanta, Ga.; Alabama City, Ala.; Birmingham, Los Angeles, Pittsburgh, Cal.; San Francisco.	17.00	12.00	12.00	13.00	14.00	14.50	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	18.00	
Minnequa, Colo.....	16.50	11.50	11.50	12.50	13.50	14.00	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	17.50	
Seattle, Wash.....	14.50	9.50	9.50	10.50	11.50	12.00	19.50	17.00	16.00	16.50	17.00	16.00	16.50	15.50	12.50	14.00	15.50	

\* Baled turnings are \$5 per gross ton higher.

**BUNDLES:** Tin can bundles are \$4 below dealers' No. 2 bundles; No. 3 bundles are \$2 less than No. 1 heavy melting.

**AT NEW YORK CITY** or Brooklyn, the maximum shipping point price is \$15.33 for No. 1 heavy melting, f.o.b. cars, f.a.s. vessel or loaded on trucks. Minimum set at \$14 per gross ton at any shipping point in U. S. Other grades carry differentials similar to those in table. New Jersey prices must be computed on basis of all-rail. At Boston the maximum is \$15.05 for No. 1 f.o.b. cars, f.a.s. vessel or loaded on trucks. Shipments from a New England shipping point to a consumer outside New England carry maximum transportation charge of \$6.66 per ton.

**SWITCHING CHARGES:** Deductions for shipping points within basing point (cents per gross ton) are: Chicago, 54c.; Pittsburgh, Brackenridge, 55c.; Detroit, 53c.; Midland, Johnstown, Sharon, Youngstown, Warren, Weirton, Cleveland, Toledo, Los Angeles, San Francisco, Pittsburgh, 42c.; Seattle, 38c.; Buffalo, Claymont, Harrisburg, 66c.; Atlanta, Birmingham, 32c.; Butler, Monessen, Canton, Steubenville, Cincinnati\*, Portsmouth, Ashland, Coatesville, Phoenixville, Bethlehem, Kokomo, Duluth and St. Louis, 28c.; Alabama City, Ala., 26c.; Minneapolis, Colo., 22c.; Middletown, 14c.; Conshohocken, Sparrows Point, 11c.

\* Basic open hearth and foundry grades, and auto springs and crank-shafts, deduct 80c. per ton.

**BASING POINT** includes switching districts of city named.

Basing point	Switching districts:
Pittsburgh	Bessemer, Homestead, Duquesne, Munhall, McKeesport
Cincinnati	Newport
St. Louis	Granite City, E. St. Louis, Madison, Ill.
Chicago	Gary
Claymont	Chester, Pa.
San Francisco	So. San Francisco, Niles, Oakland

**MAXIMUM SHIPPING POINT PRICE:** Where shipment is wholly or partially by rail or vessel, or combination of rail and vessel, the scrap is at shipping point when placed f.o.b. railroad or f.a.s. vessel.

For motor vehicle shipments scrap is at shipping point when loaded. Then maximum shipping point price shall be: (a) For shipping point located within a basing point, prices shown in above table for scrap at basing point in which shipping point is located, minus applicable switching charge deduction shown in paragraph above labeled "Switching Charges." (b) For shipping points outside basing point, price listed in above table hereof for scrap at most favorable basing point, minus lowest charge for transportation from shipping point to such basing point by rail or water carrier or combination. Where vessel movement is involved, in lieu of established dock charge or any cost customarily incurred at the dock, 75c. per ton must be included as part of deduction in computing shipping point price; 50c. at Memphis; \$1 at Great Lakes ports; and \$1.25 at New England ports. If no established transportation rate exists for a portion of movement from shipping to basing point, actual charge or cost customarily incurred by shipper in such portion of movement shall be included as part of deduction in computing shipping point price. For exceptions see official order.

**UNPREPARED SCRAP:** For unprepared scrap, maximum prices shall be \$3.50 (and in the case of the material from which No. 1, No. 2, and No. 3 bundles are made \$4) less than maximum prices for the corresponding prepared scrap. In no case, however, shall electric furnace, acid open hearth and foundry grades be used as the corresponding prepared scrap. A preparation-in-transit charge for unprepared scrap is provided.

**NEW LISTED GRADES:** Priced in dollars per gross ton less than No. 1 heavy melting steel. Pit scrap, ladle skulls, slag reclaim, etc., of 85% or more Fe priced less \$2; 75 to 85% Fe less \$4; under 75% Fe less \$8 per ton. Mill scale less \$8 per ton. Mill cinder and grindings, shipping point maximum price of \$4 per gross ton at all U. S. shipping points.

**CHEMICAL BORINGS:** No. 1 (new, clean, containing not more than 1% oil), \$1 less than No. 1 heavy melting; No. 2 (new, clean, containing not more than 1.5% oil), \$2 less than No. 1 heavy melting. If loaded in box cars add 75c. mill scale, \$8 less than No. 1 heavy melting.

## Tool Steel Scrap Prices (MPR 379)

### SEGREGATED

	Solids Per Lb. Cont. W	Turnings Per Lb. Cont. W
Type 1. 12% min. W, 1% max. Mo.....	\$1.80	\$1.60
Type 2. 5 to 12% W, 1% max. Mo.....	1.60	1.40
Type 3. 1 to 5% W, 1.5% max. Mo.....	1.25	1.25
Type 4. 7% min. Mo, 2% max. W.....	0.125	0.105
Type 5. 3.5 to 6% Mo, 4.5 to 6% W.....	0.135	0.115

\* Per lb. of scrap material.

If segregated, a premium of \$1.50 per lb. of contained Co allowed if Co content is 3% or over. No scrap considered segregated if Co content ranges between 0.5 and 3%.

If Cu or Ni content over 0.25%, price shall be reduced by 50%.

If 500 lb. or less is sold, either segregated or unsegregated, price shall be reduced 2c. per lb. of scrap material.

### UNSEGREGATED SOLIDS

\$1.50 per lb. contained W if 5% or more. \$1.30 per lb. contained W if 5% or more. \$1.15 per lb. contained W if 1 to 5%. \$0.80 per lb. contained Mo if 1.5% or more. \$0.70 per lb. contained Mo if 1.5% or more.

If both W and Mo are within ranges, payment may be for both W and Mo content.

### UNSEGREGATED TURNINGS

## Cast Iron Scrap

Maximum on-line price, per gross ton, for any of the following cast grades will be the price shown at the highest priced zone in which the railroad operates or is located.

	Per Gross Ton		
	Zone A	Zone B	Zone C
Cast Iron, No. 1.....	\$18.00	\$19.00	\$20.00
Cast Iron, No. 2.....	17.00	18.00	19.00
Cast Iron, No. 3.....	14.50	15.50	16.50
Cast Iron, No. 4.....	13.25	14.25	15.25
Cast Iron Brake Shoes.....	13.25	14.25	15.25
Malleable.....	20.00	21.00	22.00
Wheels, No. 1.....	18.00	19.00	20.00

Zone A includes Mont., Idaho, Wyo., Nev., Utah, Ariz., and N. M. Zone B includes N. D., S. D., Neb., Colo., Kan., Okla., Texas, and Fla. Zone C includes all states not named in zones A and B, and includes switching district of Kansas City, Kansas-Missouri.

For cast, an in-transit preparation fee will be applicable only for preparing Cast iron No. 3 into Cast Iron No. 1, for which the maximum preparation fee shall be \$3.50 per gross ton. (Previous dealer fee was \$2.50.)

**CAST IRON GRADE DEFINITIONS:** Cast Iron No. 1—Cast iron scrap such as columns, pipe, plates and/or castings of miscellaneous nature, but free from stove plate, brake shoes, and/or burnt scrap. Must be cupola size not over 24 x 30 in. and no pieces to weigh more than 150 lb. Free of foreign material. No. 2—Cast iron scrap in pieces weighing over 150 lb. not more than 500 lb. and free from burnt cast. No. 3—Cast iron scrap in pieces over 500 lb., includes cylinders, driving wheel centers, and/or all other castings. Free from hammer blocks or bases. No. 4—Burnt cast iron scrap such as grate bars, stove parts, and/or miscellaneous burnt scrap. No. 5—Driving and/or car brake shoes of all types except composition filled. Malleable—Malleable parts of automobiles, railroad cars, and locomotives. No. 7—Wheels, No. 1, includes cast iron car and/or locomotive wheels.

# Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*.

[Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel:					Pig Iron:				
(Cents Per Lb.)					(Per Gross Ton)				
	July 4, 1944	June 27, 1944	May 30, 1944	July 6, 1943		July 4, 1944	June 27, 1944	May 30, 1944	July 6, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10	No. 2 fdy., Philadelphia	\$25.84	\$25.84	\$25.84	\$25.89
Cold rolled sheets	3.05	3.05	3.05	3.05	No. 2, Valley furnace	24.00	24.00	24.00	24.00
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50	No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
Hot rolled strip	2.10	2.10	2.10	2.10	No. 2, Birmingham	20.38	20.38	20.38	20.38
Cold rolled strip	2.80	2.80	2.80	2.80	No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Plates	2.10	2.10	2.10	2.10	Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Plates, wrought iron	3.80	3.80	3.80	3.80	Basic, Valley furnace	23.50	23.50	23.50	23.50
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00	Malleable, Chicago†	24.00	24.00	24.00	24.00
					Malleable, Valley	24.00	24.00	24.00	24.00
					L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
					Ferromanganese†	135.00	135.00	135.00	135.00
Tin and Terne Plate:					†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.				
(Dollars Per Base Box)					‡For carlots at seaboard.				
Tin plate, standard cokes	\$5.00	\$5.00	\$5.00	\$5.00					
Tin plate, electrolytic	4.50	4.50	4.50	4.50					
Special coated mfg. ternes	4.30	4.30	4.30	4.30					
Bars and Shapes:					Scrap:				
(Cents Per Lb.)					(Per Gross Ton)				
Merchant bars	2.15	2.15	2.15	2.15	Heavy melt'g steel, P'gh.	\$20.00	\$20.00	\$20.00	\$20.00
Cold finished bars	2.65	2.65	2.65	2.65	Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Alloy bars	2.70	2.70	2.70	2.70	Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
Structural shapes	2.10	2.10	2.10	2.10	No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Stainless bars (No. 302)	24.00	24.00	24.00	24.00	Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
Wrought iron bars	4.40	4.40	4.40	4.40	No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
					No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
					No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Wire and Wire Products:									
(Cents Per Lb.)									
Plain wire	2.60	2.60	2.60	2.60					
Wire nails	2.55	2.55	2.55	2.55					
Rails:					Coke, Connellsville:				
(Dollars Per Gross Ton)					(Per Net Ton at Oven)				
Heavy rails	\$40.00	\$40.00	\$40.00	\$40.00	Furnace coke, prompt	\$7.00	\$7.00	\$7.00	\$6.50
Light rails	40.00	40.00	40.00	40.00	Foundry coke, prompt	8.25	8.25	8.25	7.50
Semi-Finished Steel:									
(Dollars Per Gross Ton)					Non-Ferrous Metals:				
Rerolling billets	\$34.00	\$34.00	\$34.00	\$34.00	(Cents per Lb. to Large Buyers)				
Sheet bars	34.00	34.00	34.00	34.00	Copper, electro., Conn.	12.00	12.00	12.00	12.00
Slabs, rerolling	34.00	34.00	34.00	34.00	Copper, Lake	12.00	12.00	12.00	12.00
Forging billets	40.00	40.00	40.00	40.00	Tin (Straits), New York	52.00	52.00	52.00	52.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00	Zinc, East St. Louis	8.25	8.25	8.25	8.25
					Lead, St. Louis	6.35	6.35	6.35	6.35
Wire Rods and Skelp:					Aluminum, Virgin, del'd	15.00	15.00	15.00	15.00
(Cents Per Lb.)					Nickel, electrolytic	35.00	35.00	35.00	35.00
Wire rods	2.00	2.00	2.00	2.00	Magnesium, ingot	20.50	20.50	20.50	20.50
Skelp	1.90	1.90	1.90	1.90	Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 165-173.

## Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

FINISHED STEEL				PIG IRON				SCRAP STEEL			
July 4, 1944				a Gross Ton				a Gross Ton			
One week ago	2.25513c.	a Lb.	23.61	One month ago	2.25513c.	a Lb.	23.61	One month ago	2.25513c.	a Lb.	23.61
One year ago	2.26190c.	a Lb.	23.61	One year ago	2.26190c.	a Lb.	23.61	One year ago	2.26190c.	a Lb.	23.61
HIGH				LOW				HIGH			
1943	2.25513c.		2.25513c.	1943	\$23.61		\$23.61	1943	\$19.17		\$19.17
1942	2.26190c.		2.26190c.	1942	23.61		23.61	1942	19.17		19.17
1941	2.43078c.		2.43078c.	1941	23.61		23.61	1941	19.17		19.17
1940	2.30467c., Jan. 2	2.24107c., Apr. 16		1940	23.61, Mar. 20	23.45, Jan. 2		1940	22.00, Jan. 7	19.17, Apr. 10	
1939	2.35367c., Jan. 3	2.26689c., May 16		1939	23.45, Dec. 23	22.61, Jan. 2		1939	21.83, Dec. 30	16.04, Apr. 9	
1938	2.58414c., Jan. 4	2.27207c., Oct. 18		1938	22.61, Sept. 19	20.61, Sept. 12		1938	22.50, Oct. 3	14.08, May 16	
1937	2.58414c., Mar. 9	2.32263c., Jan. 4		1937	23.25, June 21	19.61, July 6		1937	15.00, Nov. 22	11.00, June 7	
1936	2.32263c., Dec. 28	2.05200c., Mar. 10		1936	23.25, Mar. 9	20.25, Feb. 16		1936	21.92, Mar. 30	12.67, June 8	
1935	2.07642c., Oct. 1	2.06492c., Jan. 8		1935	19.74, Nov. 24	18.73, Aug. 11		1935	17.75, Dec. 21	12.67, June 9	
1934	2.15367c., Apr. 24	1.95757c., Jan. 2		1934	18.84, Nov. 5	17.83, May 14		1934	13.42, Dec. 10	10.33, Apr. 29	
1933	1.95578c., Oct. 3	1.75836c., May 2		1933	17.90, May 1	16.90, Jan. 27		1933	13.00, Mar. 13	9.50, Sept. 25	
1932	1.89196c., July 5	1.83901c., Mar. 1		1932	16.90, Dec. 5	13.56, Jan. 3		1932	12.25, Aug. 8	6.75, Jan. 3	
1931	1.99626c., Jan. 13	1.86586c., Dec. 29		1931	14.81, Jan. 5	13.56, Dec. 6		1931	8.50, Jan. 12	6.43, July 5	
1930	2.25488c., Jan. 7	1.97319c., Dec. 9		1930	15.90, Jan. 6	14.79, Dec. 15		1930	11.33, Jan. 6	8.50, Dec. 29	
1929	2.31773c., May 28	2.26498c., Oct. 29		1929	18.21, Jan. 7	15.90, Dec. 16		1929	15.00, Feb. 18	11.25, Dec. 9	
Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.				Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.				Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.			



# ... Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Apply to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price to be used in figuring annealed, bright finish wires, commercial spring wire.

Basing Point ↓ Product	DELIVERED TO												
	Pitts- burgh	Chicago	Gary	Cleve- land	Birm- ingham	Buffalo	Youngs- town	Spar- rows Point	Granite City	Middle- town, Ohio	Gulf Ports, Cars	Provo, Utah	Pacific Ports, Cars
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.65¢
Cold Rolled Sheets <sup>1</sup>	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢
Long Ternes <sup>2</sup>	3.80¢	3.80¢	3.80¢										4.55¢
Hot Rolled Strip <sup>2</sup>	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢
Cold Rolled Strip <sup>4</sup>	2.80¢	2.90¢		2.80¢			2.80¢		(Worcester = 3.00¢)				2.90¢
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢						2.56¢
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢		(Worcester = 3.35¢)				3.05¢
Coke Tin Plate, Base Box	\$5.00	\$5.00	\$5.00						\$5.10				
.50 Electro Tin Plate, Box	\$4.50	\$4.50	\$4.50						\$4.60				
.75	\$4.65		\$4.65						\$4.75				
Black Plate (29 gage) <sup>5</sup>	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢ <sup>12</sup>
Mfg. Ternes, Special Box	\$4.30	\$4.30	\$4.30						\$4.40				
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			(Duluth = 2.25¢)	2.50¢			2.80¢
Rail Steel Bars <sup>6</sup>	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢			2.80¢
Reinforcing (Billet) Bars <sup>7</sup>	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		2.50¢			2.55¢ <sup>13</sup>
Reinforcing (Rail) Bars <sup>7</sup>	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢			2.55¢ <sup>13</sup>
Cold Finished Bars <sup>8</sup>	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)	(Toledo = 2.80¢)			2.99¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢			(Bethlehem, Massillon, Canton = 2.70¢)				2.90¢
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢							3.45¢
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	2.35¢	2.45¢	2.60¢	2.65¢	2.32¢
Floor Plates	3.35¢	3.35¢								3.70¢			4.00¢
Alloy Plates	3.50¢	3.50¢							(Coatesville = 3.50¢)	3.95¢			4.15¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢			(Bethlehem = 2.10¢)	2.45¢			2.75¢
SPRING STEEL, C-R													
0.26 to 0.50 Carbon	2.80¢			2.80¢					(Worcester = 3.00¢)				
0.51 to 0.75 Carbon	4.30¢			4.30¢					(Worcester = 4.50¢)				
0.76 to 1.00 Carbon	6.15¢			6.15¢					(Worcester = 6.35¢)				
1.01 to 1.25 Carbon	8.35¢			8.35¢					(Worcester = 8.55¢)				
Bright Wire <sup>14</sup>	2.60¢	2.60¢		2.60¢	2.60¢				(Worcester = 2.70¢)	(Duluth = 2.65¢)			3.10¢
Galvanized Wire													
Spring (High Carbon)	3.20¢	3.20¢		3.20¢					(Worcester = 3.30¢)				3.70¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢

## EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. \$41 basing pts.; Wheeling Steel Corp. \$34 Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. \$41; Phoenix Iron Co. (rerolling) \$41, (forging) \$47; Granite City Steel Co. \$47.50.  
Blooms—Phoenix Iron Co. (rerolling) \$41, (forging) \$47.  
Sheet Bar—Empire Sheet & Tin Plate Co. \$39 mill; Wheeling Steel Corp. \$38 Portsmouth, Ohio.  
Billets, Forging—Andrews Steel Co. \$50 basing pts.; Follansbee Steel Corp. \$49.50 Toronto; Phoenix Iron Co. \$47.00 mill. Geneva Steel Co. \$64.64 f.o.b. Pacific Coast Ports.  
Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area \$34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) \$41 mill; Wheeling Steel Corp. (small) \$36 Portsmouth, Ohio; (blooming mill sizes) applicable base, f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at \$39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. \$41 mill; Continental Steel Corp. (1½ x 1½) \$39.50, (2 x 2) \$40.60 Kokomo, Ind. (these prices include \$1 size extra); Keystone Steel & Wire Co. \$36.40 Peoria; Connors Steel Co. \$50.69 Birmingham; Ford Motor Co. \$34 Dearborn, Mich. Geneva Steel Co. \$58.64 f.o.b. Pacific Coast ports.  
Structural Shapes—Phoenix Iron Co. \$2.35

basing pts. (export) \$2.50 Phoenixville; Knoxville Iron Co. \$2.30 basing points.  
Bar Size Shapes—(Angles) W. Ames & Co., 10 tons or over, \$3.10 mill.  
Rails—Sweet Steel Co. (rail steel) \$50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., \$45 Pueblo.  
Hot Rolled Plate—Granite City Steel Co. \$2.65 mill; Knoxville Iron Co. \$2.25 basing pts.; Kaiser Co. and Geneva Steel Co. \$3.20 Pacific Ports; Central Iron & Steel Co. \$2.50 basing points; Granite City Steel Co. \$2.35 Granite City.  
Merchant Bars—W. Ames Co., 10 tons and over, \$2.85 mill; Eckels-Nye Steel Corp., \$2.50 basing pts. (rail steel) \$2.40; Phoenix Iron Co. \$2.40 basing pts.; Sweet Steel Co. (rail steel) \$2.35 mill; Joslyn Mfg. & Supply Co., \$2.35 Chicago; Calumet Steel Dic., Borg Warner Corp. (8 in. mill bars) \$2.35 Chicago; Knoxville Iron Co. \$2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. \$2.75 f.o.b. Milton, Pa.  
Reinforcing Bars—W. Ames & Co., 10 tons and over, \$2.85 mill; Sweet Steel Co. (rail steel) \$2.35 mill; Columbia Steel Co. \$2.50 Pacific Ports.  
Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/1 freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/1 freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel

Corp. on allocation outside New England, Buffalo c.f. base plus c/1 freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/1 freight; Medart Co. in certain areas, Chicago c.f. base plus c/1 freight Chicago to St. Louis, f.o.b. St. Louis.  
Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.  
Hot Rolled Strip—Joslyn Mfg. & Supply Co. \$2.30 Chicago; Knoxville Iron Co. \$2.25 basing pts.  
Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., \$2.25 Parkersburg.  
Galvanized Sheets—Andrews Steel Co., \$3.75 basing pts.; Parkersburg Iron & Steel Co. \$3.85 Parkersburg; Apollo Steel Co. \$3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.  
Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.  
Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is \$2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

# PRICES

## WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates 1/2 in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	3.518	4.872*	5.018a	3.922	4.772	3.605	3.668	3.822	4.072	5.968	7.068	7.272	8.322
New York	3.580	4.613*	5.010	3.974*	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744*	5.224*	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.652	4.894	3.902	4.752	3.594	3.759	3.802	4.052	.....	.....	.....	.....
Norfolk	3.771	4.966	5.371	4.165	4.865	3.971	4.002	4.065	4.165	.....	.....	.....	.....
Chicago	3.25	4.20	5.231	3.60	4.651*	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.367	4.337*	5.272*	3.737	4.7371*	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.674*	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.754*	3.619	4.869	3.63	3.49	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.004	3.70	4.6591*	3.609	3.609	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475*	4.825*	3.675	4.711	3.611	3.611	3.611	4.011	.....	.....	.....	.....
St. Louis	3.397	4.347*	5.172*	3.747	4.8311*	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.46	5.254*	3.86	4.351*	3.811*	3.811*	3.761*	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608*	4.215	4.165	4.165	4.165	4.115	4.43	.....	.....	.....	.....
Indianapolis	3.58	3.58	4.588	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45	4.68	4.75	3.70	4.065	4.065	4.065	4.015	4.33	.....	.....	.....	.....
Memphis	3.9657	3.265	4.215	3.65	4.065	4.065	4.065	4.015	4.33	.....	.....	.....	.....
New Orleans	4.058*	4.95	5.358	4.308	4.158	4.158*	4.158*	4.108*	4.629	.....	.....	.....	.....
Houston	3.763	5.573	6.313*	4.313	4.25	4.25	4.25	3.75	6.373*	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.293	6.104	4.95	5.61315	4.95	4.95	4.85	5.583	8.304	9.404	9.404	10.454
San Francisco	4.514	7.304	6.354	4.504	7.33317	4.854	4.854	4.354	5.333	8.304	9.404	9.404	10.454
Seattle	4.8512	7.054	5.954	4.2512	4.7512	4.7512	4.7512	4.3512	5.783	.....	.....	.....	.....
Portland	4.6511	6.604	5.754	4.7511	4.7511	4.7511	4.7511	4.4511	5.533	8.304	9.404	9.404	9.404
Salt Lake City	4.5317	.....	6.171*	5.5317	.....	4.9817	4.9817	4.8817	5.90	.....	.....	.....	.....

## NATIONAL EMERGENCY (N. E.) STEELS (Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT							Basic Open-Hearth		Electric Furnace		
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar-Strip	Billets, Blooms and Slabs	Bars and Bar-Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35				.10c	\$2.00		
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25c	\$25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.26/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20				.40	8.00		
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20				.40	8.00		
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25			.65	13.00		
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40			.65	13.00		
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9449	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

\*Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and \$54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, \$5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

## Base Quantities

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over. (19) 4000 lb. and over. (20) 5000 lb. and over. (21) 6000 lb. and over. (22) 7000 lb. and over. (23) 8000 lb. and over. (24) 9000 lb. and over. (25) 10,000 lb. and over. (26) 11,000 lb. and over. (27) 12,000 lb. and over. (28) 13,000 lb. and over. (29) 14,000 lb. and over. (30) 15,000 lb. and over. (31) 16,000 lb. and over. (32) 17,000 lb. and over. (33) 18,000 lb. and over. (34) 19,000 lb. and over. (35) 20,000 lb. and over. (36) 21,000 lb. and over. (37) 22,000 lb. and over. (38) 23,000 lb. and over. (39) 24,000 lb. and over. (40) 25,000 lb. and over. (41) 26,000 lb. and over. (42) 27,000 lb. and over. (43) 28,000 lb. and over. (44) 29,000 lb. and over. (45) 30,000 lb. and over. (46) 31,000 lb. and over. (47) 32,000 lb. and over. (48) 33,000 lb. and over. (49) 34,000 lb. and over. (50) 35,000 lb. and over. (51) 36,000 lb. and over. (52) 37,000 lb. and over. (53) 38,000 lb. and over. (54) 39,000 lb. and over. (55) 40,000 lb. and over. (56) 41,000 lb. and over. (57) 42,000 lb. and over. (58) 43,000 lb. and over. (59) 44,000 lb. and over. (60) 45,000 lb. and over. (61) 46,000 lb. and over. (62) 47,000 lb. and over. (63) 48,000 lb. and over. (64) 49,000 lb. and over. (65) 50,000 lb. and over. (66) 51,000 lb. and over. (67) 52,000 lb. and over. (68) 53,000 lb. and over. (69) 54,000 lb. and over. (70) 55,000 lb. and over. (71) 56,000 lb. and over. (72) 57,000 lb. and over. (73) 58,000 lb. and over. (74) 59,000 lb. and over. (75) 60,000 lb. and over. (76) 61,000 lb. and over. (77) 62,000 lb. and over. (78) 63,000 lb. and over. (79) 64,000 lb. and over. (80) 65,000 lb. and over. (81) 66,000 lb. and over. (82) 67,000 lb. and over. (83) 68,000 lb. and over. (84) 69,000 lb. and over. (85) 70,000 lb. and over. (86) 71,000 lb. and over. (87) 72,000 lb. and over. (88) 73,000 lb. and over. (89) 74,000 lb. and over. (90) 75,000 lb. and over. (91) 76,000 lb. and over. (92) 77,000 lb. and over. (93) 78,000 lb. and over. (94) 79,000 lb. and over. (95) 80,000 lb. and over. (96) 81,000 lb. and over. (97) 82,000 lb. and over. (98) 83,000 lb. and over. (99) 84,000 lb. and over. (100) 85,000 lb. and over. (101) 86,000 lb. and over. (102) 87,000 lb. and over. (103) 88,000 lb. and over. (104) 89,000 lb. and over. (105) 90,000 lb. and over. (106) 91,000 lb. and over. (107) 92,000 lb. and over. (108) 93,000 lb. and over. (109) 94,000 lb. and over. (110) 95,000 lb. and over. (111) 96,000 lb. and over. (112) 97,000 lb. and over. (113) 98,000 lb. and over. (114) 99,000 lb. and over. (115) 100,000 lb. and over. (116) 101,000 lb. and over. (117) 102,000 lb. and over. (118) 103,000 lb. and over. (119) 104,000 lb. and over. (120) 105,000 lb. and over. (121) 106,000 lb. and over. (122) 107,000 lb. and over. (123) 108,000 lb. and over. (124) 109,000 lb. and over. (125) 110,000 lb. and over. (126) 111,000 lb. and over. (127) 112,000 lb. and over. (128) 113,000 lb. and over. (129) 114,000 lb. and over. (130) 115,000 lb. and over. (131) 116,000 lb. and over. (132) 117,000 lb. and over. (133) 118,000 lb. and over. (134) 119,000 lb. and over. (135) 120,000 lb. and over. (136) 121,000 lb. and over. (137) 122,000 lb. and over. (138) 123,000 lb. and over. (139) 124,000 lb. and over. (140) 125,000 lb. and over. (141) 126,000 lb. and over. (142) 127,000 lb. and over. (143) 128,000 lb. and over. (144) 129,000 lb. and over. (145) 130,000 lb. and over. (146) 131,000 lb. and over. (147) 132,000 lb. and over. (148) 133,000 lb. and over. (149) 134,000 lb. and over. (150) 135,000 lb. and over. (151) 136,000 lb. and over. (152) 137,000 lb. and over. (153) 138,000 lb. and over. (154) 139,000 lb. and over. (155) 140,000 lb. and over. (156) 141,000 lb. and over.



## PRICES

### SEMI-FINISHED STEEL

#### Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill... \$31.00  
 Exceptions: Phoenix Iron Co. may charge \$38.75; Kaiser Co., \$43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., \$34.25.

#### Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown... \$36.00  
 Exceptions: Phoenix Iron Co. may charge \$43.00; Empire Sheet & Tinplate Co., \$39.25, f.o.b. Mansfield, Ohio; West Coast producers, \$48.00, f.o.b. Pacific Coast Ports.

#### Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh... \$45.00  
 Exceptions: C/L delivered Detroit add \$1.00; delivered East Michigan add \$3.00. Connors Steel Co. may charge \$45.00 f.o.b. Birmingham.

#### Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are \$2.00 higher; delivered E. Michigan, \$3 higher; f.o.b. Duluth, billets only, \$2.00 higher; billets f.o.b. Pacific ports are \$12 higher. Provo, \$11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

Per Gross Ton

Rerolling... \$34.00  
 Forging quality... 40.00  
 For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

#### Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton... 54.00  
 Price delivered Detroit \$2.00 higher; E. Michigan \$3.00 higher.

#### Sheet Steel

Per Gross Ton

3 in. to 12 in. .... \$52.00  
 12 in. to 18 in. .... 54.00  
 18 in. and over .... 56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are \$2.00 higher; E. Michigan, \$3 higher.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

#### Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

Per Gross Ton

Open hearth or bessemer ..... \$34.00

#### Shelf

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

Per Lb.

Grooved, universal and sheared .. 1.90c.

#### Wire Rods

(No. 5 to 9/32 in.)

Per Lb.

Pittsburgh, Chicago, Cleveland .. 2.00c.  
 Worcester, Mass. .... 2.10c.  
 Birmingham .... 2.00c.  
 San Francisco .... 2.50c.  
 Galveston .... 2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher.

Quantity extras apply.

### TOOL STEEL

(P.A.B. Pittsburgh, Bethlehem, Syracuse)

Base per lb.

High speed ..... 67c.  
 Straight molybdenum ..... 54c.  
 Tungsten-molybdenum ..... 57 1/2c.  
 High-carbon-chromium ..... 43c.  
 Oil hardening ..... 24c.  
 Special carbon ..... 22c.  
 Extra carbon ..... 18c.  
 Regular carbon ..... 14c.

Warehouse prices east of Mississippi

are 2c. a lb. higher; west of Mississippi

are higher.

## Where a gentle push



### is better than a one-two punch

There are lots of operations on pneumatic machinery where the smack of full line air pressure is definitely not needed. Not only would a reduced working pressure do a better job with easier control, but it would stop waste of air and stretch compressor capacity.

Efficient operation of pneumatic presses, riveters, air chucks, spraying equipment, pneumatic cylinders, and similar machines is more easily obtained with a pressure regulator for each machine. Working pressure can be adjusted to suit the needs of each

machine, and each job.

Hannifin Air Pressure Regulating Valves give you the quick, accurate adjustment and sensitive regulation that gets the most out of air power and air operated equipment. The exclusive piston-type design assures dependable regulation of working pressures, large volumetric capacity, instant adjustment over the entire working range. Built in three standard sizes, 3/8, 1/2 and 3/4 inch, for use on initial pressures up to 150 lbs. sq. in. Write for Bulletin 56.

# Hannifin

Manufacturing Company, 621-631 South Kolmar Ave.  
 Chicago 24, Illinois

## PRECISION WORK ON SMALL PARTS

(up to 20 lbs.)

Induction heat-treating (30 KW)

External Grinding (up to 10" x 36")

Internal Grinding

Surface Grinding (plain and rotary)

Milling—vertical, horizontal, contour

Duplicating

Automatic lathe work

Etc.

For list of equipment, pictures and other information concerning plant write

## GENERAL REFINERIES, INC.

27 NORTH 4TH STREET, MINNEAPOLIS 1, MINNESOTA

# JOHNSON XLO

## Music Wire



Wire of a thousand uses. Drawn under strict laboratory control all the way from original steel to finished product. When you specify Johnson XLO Music Wire you are certain of a high quality product in every respect.

Note coil spring that comes to you on every coil of wire.

Stock sizes .003" to .200" dia.  
In coils or packages.

### JOHNSON STEEL & WIRE CO., INC.

WORCESTER 1, MASSACHUSETTS.

NEW YORK    ATLANTA    AKRON    CHICAGO    LOS ANGELES

# PERFORATED METALS

## INDUSTRIAL and ORNAMENTAL



To produce the highest quality of perforated metal as used in the industrial arts and for ornamentation has been the ambition and persistent endeavor of this company. The highest quality best serves the user. We are here to serve you.

ANY METAL • ANY PERFORATION

## The Harrington & King

PERFORATING CO.

5657 FILLMORE STREET—CHICAGO 44, ILL.  
Eastern Office: 114 Liberty Street, New York 6, N. Y.

PRICES			
<b>WELDED PIPE AND TUBING</b>			
Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills			
(F.o.b. Pittsburgh only on wrought pipe)			
Base Price—\$200.00 per Net Ton			
<b>Steel (Butt Weld)</b>			
1/2 in. ....	63 1/2	Black	Gale
3/4 in. ....	66 1/2		
1 to 3 in. ....	68 1/2		
<b>Wrought Iron (Butt Weld)</b>			
1/2 in. ....	24		
3/4 in. ....	30		
1 and 1 1/4 in. ....	34		
1 1/2 in. ....	38		
2 in. ....	37 1/2		
<b>Steel (Lap Weld)</b>			
2 in. ....	61		
2 1/2 and 3 in. ....	64		
3 1/2 to 6 in. ....	66		
<b>Wrought Iron (Lap Weld)</b>			
2 in. ....	30 1/2		
2 1/2 to 3 1/2 in. ....	31 1/2		
4 in. ....	33 1/2		
4 1/2 to 8 in. ....	32 1/2		
<b>Steel (Butt, extra strong, plain ends)</b>			
1/2 in. ....	61 1/2		
3/4 in. ....	65 1/2		
1 to 3 in. ....	67		
<b>Wrought Iron (Same as Above)</b>			
1/2 in. ....	25		
3/4 in. ....	31		
1 to 2 in. ....	38		
<b>Steel (Lap, extra strong, plain ends)</b>			
2 in. ....	59		
2 1/2 and 3 in. ....	63		
3 1/2 to 6 in. ....	66 1/2		
<b>Wrought Iron (Same as Above)</b>			
2 in. ....	33 1/2		
2 1/2 to 4 in. ....	39		
4 1/2 to 6 in. ....	37 1/2		
On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.			
F.o.b. Gary prices are two points lower discount or \$4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher on all butt weld.			
<b>CAST IRON WATER PIPE</b>			
Per Net Ton			
6-in. and larger, del'd Chicago... \$54.00			
6-in. and larger, del'd New York... \$52.00			
6-in. and larger, Birmingham... \$46.00			
6-in. and larger f.o.b. cars, San Francisco or Los Angeles... \$68.00			
6-in. and larger f.o.b. cars, Seattle... \$71.00			
Class "A" and gas pipe, \$3 extra; 4-in. pipe is \$3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are \$45 at Birmingham and \$53.80 delivered Chicago, \$59.40 at San Francisco and Los Angeles, and \$70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.			
<b>BOILER TUBES</b>			
Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.			
		Seamless	Lap
		Cold	Hot
		Drawn	Roll
2 in. o.d. 13 B.W.G.	15.03	13.04	12.13
2 1/2 in. o.d. 12 B.W.G.	20.21	17.54	16.13
3 in. o.d. 12 B.W.G.	22.48	19.50	18.13
3 1/2 in. o.d. 11 B.W.G.	28.37	24.62	22.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66
(Extras for less carload quantities)			
40,000 lb. or ft., and over			
30,000 lb. or ft. to 39,999 lb. or ft.			5%
20,000 lb. or ft. to 29,999 lb. or ft.			10%
10,000 lb. or ft. to 19,999 lb. or ft.			20%
5,000 lb. or ft. to 9,999 lb. or ft.			30%
2,000 lb. or ft. to 4,999 lb. or ft.			45%
Under 2,000 lb. or ft.			65%



## PRICES

### WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails.....	\$2.55	\$3.05
Coated nails.....	2.55	3.05
Cut nails, carloads.....	3.85	....
	Base per 100 Lb.	
Annealed fence wire....	\$3.05	\$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*....	\$0.67	\$0.85
Fence posts, carloads...	.69	.86
Single loop bale ties...	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbed wire..	.70	....

\*15½ gage and heavier. \*\*On 30-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

### BOLTS, NUTS, RIVETS, SET SCREWS

#### Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

#### Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter...	65½
¾ in. & ½ in. x 6 in. & shorter...	63½
¾ to 1 in. x 6 in. & shorter...	61
1½ in. and larger, all lengths...	59
All diameters over 6 in. long...	59
Lag, all sizes...	62
Plow bolts...	65

#### Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

½ in. and smaller.....	62
¾ in. to 1 in. inclusive.....	59
1½ to 1½ in. inclusive.....	57
1½ in. and larger.....	56
On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.	

#### Semi-Fin. Hexagon Nuts

U.S.S. S.A.E.

Base discount less keg lots

7/16 in. and smaller.....	64
¾ in. and smaller.....	62
¾ in. through 1 in.....	60
9/16 in. to 1 in.....	59
1½ in. through 1½ in.....	57
1½ in. and larger.....	56
In full keg lots, 10 per cent additional discount.	

#### Stove Bolts

Consumer

Packages, nuts loose.....	71 and 10
In packages, with nuts attached....	71
In bulk.....	80
On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.	

#### Large Rivets

(½ in. and larger)

Base per 100 lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham.....	\$3.75
--	--------

#### Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham.....	65 and 5
--	----------

#### Cap and Set Screws

Consumer

	Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.....	64
Upset set screws, cup and oval points	71
Milled studs.....	46
Flat head cap screws, listed sizes....	36
Fillister head cap, listed sizes.....	51
Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.	

### ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C. ....	\$6.00	\$12.00
15-lb. coating I.C. ....	7.00	14.00
20-lb. coating I.C. ....	7.50	15.00

# LEE

## Quality Springs

ALL SHAPES • ALL SIZES • ALL MATERIALS



LEE SPRING COMPANY, Inc.

30 MAIN STREET

BROOKLYN, N.Y.



# KING

## RINGS • FLANGES

## GEAR BLANKS

King Engineering Department & extensive plant facilities are always at your service on any ring or flange problem you may have.



BANDS



LEG OUT



LEG IN



FLATS



SQUARES



STEM OUT

## KING FIFTH WHEEL COMPANY

2900 NORTH SECOND STREET • PHILADELPHIA 33 • PENNSYLVANIA

# PRICES

## PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations on gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	\$25.50	\$25.00	\$26.50	\$26.00		
Brooklyn	27.50	27.00		28.00		
Jersey City	26.53	26.03	27.53	27.03		
Philadelphia (4)	25.84	25.34	26.84	26.34	\$30.74	
Bethlehem, Pa.	25.00	24.50	26.00	25.50		
Everett, Mass.	25.00	24.50	26.00	25.50		
Swedeland, Pa.		24.50	26.00	25.50		
Steelton, Pa.		24.50			29.50	
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	
Sparrows Point, Md.	25.00	24.50				
Erie, Pa.	24.00	23.50	25.00	24.50		
Neville Island, Pa.	24.00	23.50	24.50	24.00		
Sharpville, Pa. (1)	24.00	23.50	24.50	24.00		
Buffalo	24.00	23.00	25.00	24.50	29.50	
Cincinnati, Ohio	25.11	24.61		25.11		
Canton, Ohio	25.39	24.89	25.89	25.39	32.69	
Manefield, Ohio	25.94	25.44	26.44	25.94	32.66	
St. Louis	24.50	24.50				
Chicago	24.00	23.50	24.50	24.00	35.46	\$37.34
Granite City, Ill.	24.00	23.50	24.50	24.00		
Cleveland	24.00	23.50	24.50	24.00	32.42	
Hamilton, Ohio	24.00	23.50		24.00		
Toledo	24.00	23.50	24.50	24.00		
Youngstown	24.00	23.50	24.50	24.00	32.42	
Detroit	24.00	23.50	24.50	24.00		
Lake Superior fc.					34.00	
Lyles, Tenn. (2)					33.00	
St. Paul	26.63	26.13	27.13	26.63	39.80	
Duluth	24.50	24.00	25.00	24.50		
Birmingham	20.38	19.00	25.00			
Los Angeles	26.95					
San Francisco	26.95					
Seattle	26.95					
Provo, Utah	22.00	21.50				
Montreal	27.50	27.50		28.00		
Toronto	25.50	25.50		26.00		

GRAY FORGE IRON: Valley or Pittsburgh furnace .....\$23.50

(1) Pittsburgh Coke & Iron Co. (Sharpville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron and Steel Co. may add another \$1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorous iron; high phosphorous sells for \$28.50 at the furnace.

(3) E. & G. Brooke Co. Birdsboro, Pa. permitted to charge \$1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge \$2.50 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, \$2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and \$1 per ton extra for each additional 0.25 per cent nickel.

## METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21 1/2 to 23 1/2
Copper, reduced, 150 and 200 mesh	20 1/2 to 25 1/2
Iron, commercial, 100 and 200 mesh, 96 + % Fe.	13 1/2 to 15 1/2
Iron, crushed, 200 mesh and finer, 90 + % Fe.	40
Iron, hydrogen reduced, 300 mesh and finer, 93 1/2 + % Fe.	43
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 32
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe.	90
Aluminum, 100 and 200 mesh.	*23 to 27
Antimony, 100 mesh	20.60
Cadmium, 100 mesh	31
Chromium, 150 mesh	11.03
Lead, 100, 200 & 300 mesh, 11 1/2 to 12 1/2	61
Manganese, 150 mesh	61
Nickel, 150 mesh	51 1/2
Solder powder, 100 mesh, 8 1/2 c. plus metal	58 1/2
Tin, 100 mesh	58 1/2
Tungsten metal powder, 98-99%, any quantity, per lb.	\$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	\$2.60
Under 100 lb.	\$3.00

\*Freight allowed east of Mississippi.

## COKE

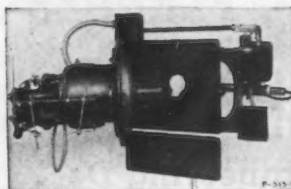
Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	\$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.88
Birmingham, del'd	10.50

\*Hand drawn ovens using trucked coal permitted to charge \$7.75 per ton plus transportation charges. \*\*Mo., Ala., and Tenn. producers—\$13.35.

## FOR ALL TYPES of INDUSTRIAL FURNACES

### Type DR ROTARY OIL BURNERS

Self-Contained  
...  
Motor Driven



There is a complete heavy duty oil burner unit designed for firing steam boilers and other equipment using No. 5 to No. 6 fuel oil. There are many exclusive features built into the type D-R. Basically the unit consists of motor, blower and centrifugal atomizer mounted on chromemolybdenum steel shaft, with or without integral, worm-driven fuel pump; also fuel strainer, electric oil shut-off valve, micrometer oil regulating valve, burner mounting plate and heavy swing joints, etc.

Six sizes available with capacities up to 90 g.p.h. for manual, modulating and full automatic operation.



Cross Section of Type SA Oil Burner

## NATIONAL AIROIL BURNER COMPANY, INCORPORATED

1271 East Sedgley Ave., Philadelphia 34, Pa.  
ESTABLISHED 1912 INCORPORATED 1917

Steam Atomizing Oil Burners—Mechanical Pressure Atomizing Oil Burners—Low Air Pressure Oil Burners—Motor-driven Rotary Oil Burners—Industrial Gas Burners—Combination Gas and Oil Burners—Fuel Oil Pumping Units—Fuel Oil Heaters—Fuel Oil Strainers and other accessories.



## PRICES

### REFRACTORIES (F.o.b. Works)

Fire Clay Brick		Per 1000
Super-duty brick, St. Louis	.....	\$64.60
First quality, Pa., Md., Ky., Mo., Ill.	.....	51.30
First quality, New Jersey	.....	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	.....	46.55
Second quality, New Jersey	.....	51.00
No. 1, Ohio	.....	43.00
Ground fire clay, net ton	.....	7.60
Silica Brick		
Pennsylvania and Birmingham	.....	\$51.30
Chicago District	.....	58.90
Silica cement, net ton (Eastern)	.....	9.00
Chrome Brick		Per Net Ton
Standard chemically bonded, Balt.,	.....	
Plymouth Meeting, Chester	.....	\$54.00
Magnesite Brick		
Standard, Balt. and Chester	.....	\$76.00
Chemically bonded, Baltimore	.....	65.00
Grain Magnesite		
Domestic, f.o.b. Balt. and Chester	.....	
in sacks (carloads)	.....	\$43.48
Domestic, f.o.b. Chewelah, Wash.	.....	
(in bulk)	.....	22.00

### RAILS, TRACK SUPPLIES (F.o.b. Mill)

Standard rails, heavier than 60 lb.	.....	
No. 1 O.H., gross ton	.....	\$40.00
Angle splice bars, 100 lb.	.....	2.70
(F.o.b. Basing Points)		Per Gross Ton
Light rails (from billets)	.....	\$40.00
Light rails (from rail steel)	.....	39.00
		Base per Lb.
Cut spikes	.....	3.00c.
Screw spikes	.....	5.15c.
Tie plates, steel	.....	2.15c.
Tie plates, Pacific Coast	.....	2.30c.
Track bolts	.....	4.75c.
Track bolts, heat treated, to rail-	.....	
roads	.....	5.00c.
Track bolts, jobbers discount	.....	63-5
Basing points, light rails, Pittsburgh,	.....	
Chicago, Birmingham; cut spikes and tie	.....	
plates—Pittsburgh, Chicago, Portsmouth,	.....	
Ohio, Weirton, W. Va., St. Louis, Kansas	.....	
City, Minnequa, Colo., Birmingham and	.....	
Pacific Coast ports; tie plates alone—	.....	
Steelton, Pa., Buffalo, Cut spikes alone—	.....	
Youngstown, Lebanon, Pa., Richmond,	.....	
Oregon and Washington ports, add 25c.	.....	

### CORROSION AND HEAT- RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

#### Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

#### Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

#### Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

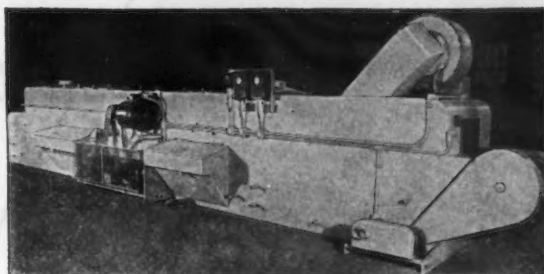
\*Includes annealing and pickling.

### ELECTRICAL SHEETS (Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.
F.o.b. Granite City, add 10c. per 100	
lb. on field grade to and including	
dynamo. Pacific ports add 75c. per 100	
lb. on all grades.	

# Ransohoff

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### RELIEVE MAN-POWER SHORTAGE

Save man-hours, dollars and cents,  
expedite every job . . . improve  
finished products . . . use  
RANSOHOFF EQUIPMENT.

There's a Ransohoff Cleaning Machine for your  
every purpose . . . for any job of any kind or size.  
Write us for details . . . or better still, let a  
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Machine illustrated cleans machine castings and stamp-  
ings before final assemblies. Small parts pass through  
in baskets; large parts lie directly on conveyor belt.

automatic, economical washing, rinsing, drying, rustproofing, pickling,  
burnishing, de-scaling, de-burring, surface treatment for paint base.

## N. RANSOHOFF, Inc.

1315 Township Ave.  
CINCINNATI, O.

## IF THERE IS A FLAW "FLASH-O-LENS" WILL FIND IT!



The new FLASH-  
O-LENS offers  
foundry - men,  
machinists, and  
many others en-  
gaged in produc-

ing metal parts for war contracts an efficient, economical  
means of examining the most minute defects during routine  
inspections.

FLASH-O-LENS consists of a portable 40x microscope com-  
bined with a perfect source of illumination in one convenient,  
compact unit . . . They are available in several models—pow-  
ered by either standard flash light dry cells or by current from  
any AC or DC outlet—and with a selection of various combina-  
tions of lenses, all interchangeable in the one lens housing.

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## E. W. PIKE & COMPANY

### Manufacturers

## ELIZABETH, N. J.



# Best! FOR LIGHT DUTY Speed!

**High Speed at Low Cost**  
**No. 4B**

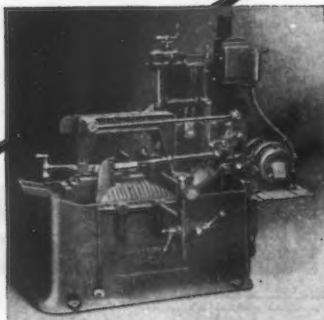
For tool room, stock room, or maintenance shop, this 6' x 6' capacity hack saw is superior to anything in its price class. Embodies similar design principles and features of MARVEL Heavy Duty production saws. Cuts a 2" standard pipe in 30 seconds—a 5" round piece of machine steel in 8 minutes!

**MARVEL SAWS**

**2-Speed and 4-Speed**  
For applications where materials of different hardnesses and alloy characteristics are to be cut, MARVEL 4B is available in 2-Speed and 4-Speed models. Built-in work tracks for holding outer end of bars are also available for all models.

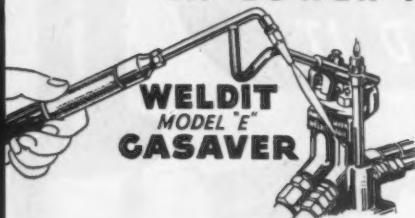
**Complete Range of Metal Sawing Machines**  
Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course.)

**ARMSTRONG-BLUM MFG. CO.**  
3700 W. Bloomingdale Ave., Chicago 39, Illinois, U.S.A.



## Safe Welding

**AT LOWER PRODUCTION COSTS**



**WELDIT  
MODEL "E"  
GASAVER**

The Weldit Gasaver shuts off the welding flame when not in use. . . . Conserves essential materials by cutting oxygen and acetylene consumption as much as fifty per cent. Prevents injury to workmen—or sudden fires—from dangerous idle torch flames. . . . Adjustment remains unaltered between welds.

When the Weldit Gasaver has been installed, you simply hang idle torch on the handy lever rod. Weight of torch pulls rod down, thus automatically shutting off supply lines. Relight instantly by passing torch over Gasaver pilot light. No bother. . . . No time lost. . . . No readjusting required. . . . Price \$10.00 at Detroit. Order today.

## Better Soldering, Annealing and Heating Jobs



**WELDIT  
MODEL "CW"  
BLOW  
TORCH**

The Weldit Model CW Blowpipe is in daily use by many foremost industrial plants. . . . Built in accordance with the recommendations of leading fabricators of sheet metal products. . . . Operates on either natural gas, manufactured gas, or other low temperature fuel gas and compressed air. Stands up under rough shop use. . . . Send for literature.

**WELDIT ACETYLENE CO.**  
641 BAGLEY AVENUE • DETROIT 26, MICH.

## PRICES

### Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.  
Carload lots (bulk) ..... \$135.00  
Carload lots (packed) ..... 141.00  
Less ton lots (packed) ..... 148.50  
Premium, \$1.70 for each 1% above 82% Mn; penalty, \$1.70 for each 1% below 78%.

### Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.  
96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.  
Carload, bulk ..... 36c.  
L.c.l. lots ..... 38c.  
95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.  
Carload, bulk ..... 34c.  
L.c.l. lots ..... 35c.

### Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.  
16-19% Mn 19-21% Mn  
3% max. Si 3% max. Si  
Carloads ..... \$35.00 \$36.00  
Less ton ..... 47.50 48.50

### Electric Ferro-silicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si ....	6.65c.	7.10c.	7.25c.
75% Si ....	8.05c.	8.20c.	8.75c.
80-90% Si ..	8.90c.	9.05c.	9.55c.
90-95% Si ..	11.05c.	11.20c.	11.65c.

Spot sales add: .45c. per lb. for 50% Si, .3c. per lb. or 75% Si .25c. per lb. for 80-90% and 90-95% Si.

### Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 \$t)  
F.o.b. Jackson, Ohio ..... \$29.50\*  
Buffalo ..... 30.75\*  
For each additional 0.50% silicon add \$1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add \$1 a ton for 0.75% phosphorus or over.  
\*OPA price established 6-24-41.

### Bessemer Ferro-silicon

Prices are \$1 a ton above silvery iron quotations of comparable analysis.

### Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe. 13.10c.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe. 13.45c.	13.45c.	13.90c.	16.80c.

### Ferro-silicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk 3.35c.	3.35c.	3.50c.	3.65c.
2000 lb.-car-load ..... 3.8c.	3.8c.	4.2c.	4.25c.

### Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.  
Carload, bulk ..... 6.05c.  
2000 lb. to carload ..... 6.70c.  
Under 2000 lb. .... 6.90c.  
Briquets, contract, basis carlots, bulk freight allowed, per lb. .... 5.80c.  
2000 lb. to carload ..... 6.30c.  
Less ton lots ..... 6.55c.

### Ferrochrome

(65-72% Cr, 2% max. Si)  
OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C ..... 23.00c.	23.00c.	23.40c.	24.00c.
0.10% C ..... 22.50c.	22.50c.	22.90c.	23.50c.
0.15% C ..... 22.00c.	22.00c.	22.40c.	23.00c.
0.20% C ..... 21.50c.	21.50c.	21.90c.	22.50c.
0.50% C ..... 21.00c.	21.00c.	21.40c.	22.00c.
1.00% C ..... 20.50c.	20.50c.	20.90c.	21.50c.
2.00% C ..... 19.50c.	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C .... 13.00c.	13.00c.	13.40c.	14.00c.



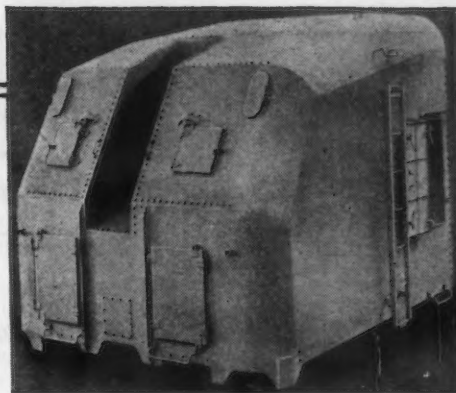
## PRICES

### Other Ferroalloys

Ferrotungsten, Standard grade, lump or $\frac{1}{4}$ " down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more...	\$1.90
Ferrovandium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per usual freight allowances, per lb. contained Va.	\$2.70
Open Hearth	\$2.80
Crucible	\$2.90
Primos	
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal	\$1.50
Vanadium pentoxide, 88%-92% $V_2O_5$ technical grade, contract basis, any quantity, per lb. contained $V_2O_5$ . Spot sales add 5c. per lb. contained $V_2O_5$ .	\$1.10
Ferroboreon, contract basis, 17.50% min. Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.	
2000 lb. to carload	\$1.20
Under 2000 lb.	1.30
Silicaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload	26c.
Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	87.5c.
No. 6	60c.
No. 79	45c.
Bortram, f.o.b. Niagara Falls	
Ton lots, per lb.	45c.
Less ton lots, per lb.	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.	
2000 lb. lots	\$2.25
Under 2000 lb. lots	\$2.30
Ferrotitanium, 40%-45%, f.o.b. 0.10c. max. Niagara Falls, N. Y., ton lots, per lb. contained Ti.	\$1.23
Less ton lots	\$1.25
Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium	\$1.35
Less ton lots	\$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload	\$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with \$3 unitage freight equalized with Rockdale, Tenn., per gross ton	\$58.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., \$3 unitage freight equalized with Nashville, per gross ton	\$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo.	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Yangeloth, Pa., per lb. contained Mo.	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo.	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add $\frac{1}{4}$ c. for spot sales	14c.
Carload lots	
Zirconium, 12-15%, contract basis, lump, f.o.b. plant usual freight allowances, per lb. of alloy	4.6c.
Carload, bulk	
Alsilfer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	
Car lots	8.75c.
Ton lots	9.25c.

### GUN TURRETS

built of heavy armor plate, for use aboard United States Navy vessels... fabricated on Brandt assembly lines.



Heavy Plate  
or Light Sheet—

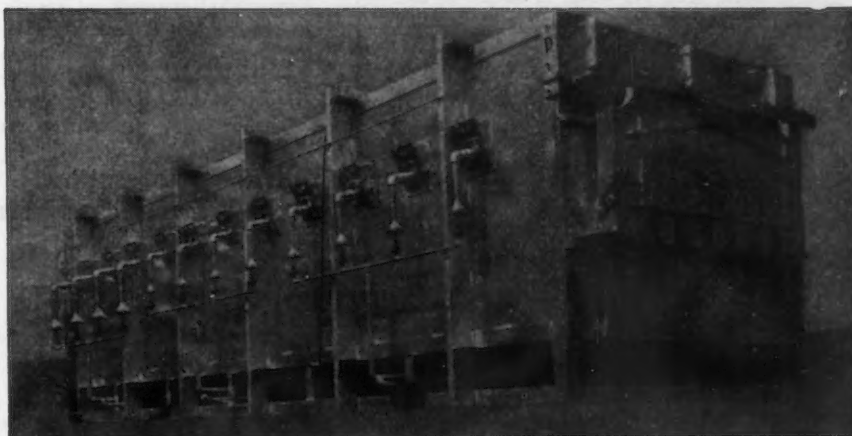
## Call BRANDT of Baltimore

for Precision in Heavy Plate and Sheet Steel Work

Here is an 8½ acre plant... with the most modern equipment for shearing, rolling, forming, welding and completely fabricating ferrous, non-ferrous and alloy metals to your specifications... from the lightest gauge up to and including 1½" mild steel or ¾" armor plate. Extensive war contracts necessarily limit our present acceptance of new business for immediate delivery. For information, address: Charles T. Brandt, Inc., Baltimore-30, Maryland.



BRANDT of Baltimore—Craftsmen in Metal Since 1890



## BELLEVUE FURNACES

are designed for the job.

In the construction of Bellevue Furnaces, painstaking consideration of the job to be done comes first. Every factor must be evaluated, every condition studied. Only then do Bellevue engineers attempt design and recommendation of furnace type.

The soundness of that policy is being demonstrated in plant after plant. Hundreds of executives in scores of varied companies have proved, to their own satisfaction, the efficiency, speed, high production level and operating economies of Bellevues that were "designed" for the job.

You, too, will find Bellevue experience and facilities a profitable investment for your own furnace needs.

Send for full details.

**BELLEVUE INDUSTRIAL FURNACE CO.**  
2974 BELLEVUE AVENUE DETROIT, MICH.



**The problem:** Many industrial processes involve frequent and rapid changes in temperature. These heat changes naturally cause considerable expansion and contraction in a metal lining. Since tanks must be leakproof and no allowance can be made for expansion in the plane of the lining, a certain amount of warping or bending movement, such as buckling, is to be expected. However, in successive operations, if a lining warps or bends again and again at the same point, it may eventually fail by cracking.

**This service condition** is frequently encountered in tanks used for "cutting" sulfuric acid. As water is added to the raw acid, the temperature rises sharply and then falls again. This cycle is repeated over and over and is accompanied by repeated expansion and contraction of the tank lining.

**How it has been met:** In our files are a number of statements from users to the effect that Tellurium Lead has given superior service under such conditions.

**One user reports:** "We recently made a check-up on our large sulfuric acid mixing tank lined with your 10 lb. Tellurium Lead. The lead was found to be very smooth and uniform with no signs of

# TELLURIUM LEAD DATA SHEET

SUBJECT:

*Temperature Change in Acid Equipment*

buckling, although this tank is used for mixing raw acid to lower specific gravities, which creates heat, which in turn steps up expansion and contraction in the lead."

**Another writes:** "We used Tellurium Lead to line a tank used for cutting 1.835 (sp.gr.) acid to battery strength, an exceptionally tough service at best. A considerable amount of heat is generated. This operation has been repeated daily for nearly three years and to date no leakage has been experienced. The lining is as good as the day installed."

**Why does Tellurium Lead give longer service?** Undoubtedly one reason is its ability to work-harden. When Tellurium Lead is stressed, it increases its tensile strength, becomes tougher and more resistant to deformation than before.

Thus movements, such as the buckling of a tank lining, actually toughen the metal at the point of deformation, with the result that subsequent expansion is relieved by movement at other points.



**A laboratory demonstration** of Tellurium Lead's capacity to work-harden is shown in the photos above. Sections of Tellurium Lead pipe (top) and pipe made from lead without tellurium (bottom) were similarly stressed by stamping and then drawn out at equal rates in a tensile testing machine. The Tellurium Lead was strengthened by the stress while the lead without tellurium was weakened and fractured.

## OTHER TELLURIUM LEAD ADVANTAGES

In addition to its capacity to work-harden, Tellurium Lead has shown in many cases an improved resistance to corrosion at elevated temperatures as well as greater resistance to failures brought about by vibration or by stress-corrosion.

### Higher corrosion resistance at elevated temperatures



Shown by the flash test. Here strips of Tellurium Lead and lead without tellurium were immersed in 96% sulfuric acid at 518° F. for three minutes. The lead without tellurium (bottom) lost 5.11% of its weight due to corrosion while the weight loss of the Tellurium Lead (top) was only 0.97%.

### Improved vibration resistance:

Demonstrated by laboratory testing machines in which test specimens are subjected to rapidly repeated stresses. In these tests which simulate vibration, Tellurium Lead was found to have a higher endurance limit, nearly twice the load being required to fracture it than lead without tellurium.

**Improved resistance to corrosion-fatigue:** The corrosion of linings, pipes and coils is frequently accelerated by mechanical stress. The corrosive action is particularly severe when the stress is dynamic. Apparatus subject to vibration furnishes a good example. It has been found that Tellurium Lead's better endurance under vibration, as well as its improved resistance to acid attack, makes it less subject to such corrosion-fatigue failures.

**Many uses:** Tellurium Lead is extensively used in handling sulfuric acid, sulfates, phosphoric and chromic acids, pickling, electroplating and other corrosive solutions. It is employed in chlorinations, reaction chamber processes, reductions and sulfonations. Typical applications include agitators, aprons, drums, ducts, fans, flooring, heat exchangers, heating and cooling coils, kettles, pans, stills, table tops, tanks and vats.



**Working properties:** Tellurium Lead may be bent, seamed, flanged and burned in the same manner as ordinary lead.



## TELLURIUM LEAD

**What it is:** Tellurium Lead of our manufacture is time-tested St. Joe chemical lead alloyed with a small quantity of tellurium. It gives the advantages of this well-known chemical lead plus important new ones.

**Available forms:** Tellurium Lead is available in sheet or pipe form or fabricated in coils for heating and cooling purposes.

**For further information** or advice regarding the use of Tellurium Lead, write:

**NATIONAL LEAD COMPANY**—New York 6, Baltimore 3, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1; National-Boston Lead Co., Boston 6; John T. Lewis & Bros. Co., Philadelphia 7; National Lead & Oil Co. of Penna., Pittsburgh 12; Georgia Lead Works, Atlanta; American Lead Corp., Indianapolis 6; Master Metals, Inc., Cleveland 10; The Canada Metal Co., Ltd., Toronto, Montreal, Winnipeg, Vancouver.